Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
2006		**00-00-2006 to 00-00-2006**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Activation and the Earnings of Reservists	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Rand Corporation,1776 Main Street,PO Box 2138,Santa Monica,CA,90407-2138**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES
The original document contains color images.

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**		**165**	

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Activation and the Earnings of Reservists

David S. Loughran, Jacob Alex Klerman, Craig Martin

Prepared for the Office of the Secretary of Defense

NATIONAL DEFENSE RESEARCH INSTITUTE

The research described in this report was prepared for the Office of the Secretary of Defense (OSD). The research was conducted in the RAND National Defense Research Institute, a federally funded research and development center sponsored by the OSD, the Joint Staff, the Unified Combatant Commands, the Department of the Navy, the Marine Corps, the defense agencies, and the defense Intelligence Community under Contract W74V8H-06-C-0002.

Library of Congress Cataloging-in-Publication Data

Loughran, David S., 1969–
Activation and the earnings of reservists / David S. Loughran, Jacob Alex Klerman, Craig Martin.
p. cm.
"MG-474."
Includes bibliographical references.
ISBN-13: 978-0-8330-3971-2 (pbk. : alk. paper)
1. United States—Armed Forces—Pay, allowances, etc. 2. United States—Armed Forces—Reserves. I. Klerman, Jacob Alex. II. Martin, Craig W., 1968– III. Title.

UC74.L68 2006
331.2'81355370973—dc22

2006023111

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Published 2006 by the RAND Corporation
1776 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138
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4570 Fifth Avenue, Suite 600, Pittsburgh, PA 15213
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Preface

This document reports statistical estimates of the effect of activation on the earnings of reservists. The document was produced as part of the RAND Corporation project entitled "The Effect of Activation on the Earnings of Reservists." That project matches administrative data on activations and military compensation from the Department of Defense (DoD) to data on civilian earnings from the Social Security Administration (SSA) to estimate the effect of activation on the earnings of reservists during and after the period they serve on active duty. Understanding the effect of activation on the earnings of reservists is crucial for designing an efficient and equitable compensation system for the reserve components.

The estimates reported in this document improve on estimates reported in *Early Results on Activations and the Earnings of Reservists* by Klerman, Loughran, and Martin (RAND TR-274-OSD, 2005). That earlier study used a preexisting and selected sample and was limited to an analysis of civilian earnings data for 2001 only and military earnings for 2001–2003. This study uses a sample that was selected specifically for this study and includes civilian earnings data through 2003 and military earnings through 2004. In addition, this study makes numerous methodological improvements over the earlier study and reports more detailed results.

This research was sponsored by the Office of the Assistant Secretary of Defense for Reserve Affairs and conducted within the Forces and Resources Policy Center of the RAND National Defense Research Institute (NDRI), a federally funded research and develop-

ment center sponsored by the Office of the Secretary of Defense, the Joint Staff, the Unified Combatant Commands, the Department of the Navy, the Marine Corps, the defense agencies, and the defense Intelligence Community.

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Introduction

In conducting the Global War on Terrorism (GWOT), the Department of Defense (DoD) has relied heavily on the reserve components. A large fraction of the reserve force has been activated at least once since September 11, 2001, and many of these activations have lasted for more than a year. This more intensive use of the reserves has been accompanied by concerns that many reservists suffer substantial financial losses as a result of being activated.[1] There are two reasons for this concern. First, what we term the "equity perspective" posits that reservists in harm's way should not also be subject to significant financial harm. Second, what we term the "compensation perspective" posits that actual and expected financial losses during and after activation might discourage reservists from reenlisting and potential reservists from enlisting.

These concerns are reinforced by survey-based evidence, such as from the May 2004 Status of Forces Survey of Reserve Component Members (SOFRC), suggesting that three-fifths of activated reservists suffer a decline in earnings when activated and that those earnings

[1] We use the term "activated" throughout this document to refer generically to a state of serving on active duty beyond the standard 30 days of annual active-duty training, whether it be for training or serving on active duty voluntarily or involuntarily as part of a mobilization or other call to active duty.

losses can be substantial. This survey-based evidence has stimulated several legislative proposals to improve the financial position of activated reservists and a congressional requirement for the DoD to survey reservists about earnings loss. However, for a variety of reasons, these survey data could lead to false inferences regarding earnings losses attributable to activation.

This study presents new evidence on how activations affect the earnings of reservists based on administrative data that allows us to avoid the problems inherent in survey-based estimates. Specifically, we combine administrative earnings data from the Defense Manpower Data Center (DMDC) and the Social Security Administration (SSA) to estimate how earnings change between years in which a reservist does and does not serve on active duty for more than 30 days. (We take 30 days of active duty service to represent a typical level of reserve service for reservists in a year in which they were not mobilized for a specific contingency). Our measure of earnings is comprehensive and precise. It includes virtually all civilian earnings, all military pays and allowances, and an imputed value of the tax preference accorded to some of those pays and allowances.

We use these data to compute what we refer to as the gross and net effect of activation on earnings. The gross effect of activation is the change in earnings between a base year (e.g., 2000) with minimal active duty days (i.e., 0–30 days) and an out year (e.g., 2003) with more than 30 days served on active duty. The net effect of activation is the difference between earnings when activated and what earnings would have been had the reservist not been activated. We estimate this net effect by comparing the difference in earnings between a base and out year for activated reservists with the difference in earnings between a base and out year for unactivated reservists (i.e., reservists who served 0–30 days on active duty in both the base and out year).

Key Findings

In our analysis, we focus primarily on how activation impacts earnings while activated in 2002 and 2003. We also present preliminary esti-

mates of the impact of activation on earnings while activated in 2004 and the impact of activation on earnings following activation. We discuss the results of all three analyses below.

Main Results for 2002 and 2003 on Activations and Earnings

Our estimates suggest that earnings loss attributable to activation is less common than suggested by survey-based analyses. Our simple estimate of the gross effect of activation is based on reservists who served 0–30 days on active duty in 2000 and more than 30 days on active duty in 2002 and 2003.[2] In this group, average earnings were $42,235 in 2000, while the earnings of these same reservists averaged $55,774 in 2002 and 2003. Thus, average earnings increased by $13,539 between the base and out year for this sample, an increase of 32 percent over base year earnings. We further estimate that, on average, activated reservists in this sample experienced a net gain in earnings of $11,165 over what they would have earned had they not been activated.

Even though earnings increase with active duty days served, some reservists do suffer an earnings loss when activated. Among the sample of reservists serving 0–30 days on active duty in 2000 and 30 or more days on active duty in 2002 or 2003, about 17 percent experienced a loss in earnings, 6 percent experienced a loss of more than $10,000, and 11 percent experienced a loss of more than 10 percent of their base year earnings.

Importantly, though, our results indicate that an even larger fraction—40 percent—of reservists who were not activated in either 2000 or 2002/2003 also experienced an earnings loss. That is, unactivated reservists are even more likely to experience an earnings loss than are activated reservists. Thus, our estimates imply that being activated actually lowers the probability of experiencing an earnings loss by 23

[2] Our main results do not employ 2001 as a base year since 2001 included activations that occurred both pre- and post-September 11, 2001. Results from analyses that employ 2001 and 2002 as base years are included in an appendix and do not differ substantively from those reported in the main body of the text.

percentage points. This does not mean that no reservist experienced an earnings loss because of activation, but simply that activation makes it less likely, on average, that a reservist will experience an earnings loss.

The body of the document reports estimates by a variety of deployment and reservist characteristics, including year activated, active-duty days served, rank, component, and self-employment status. The general findings reported above—substantial mean earnings gains and, compared to survey-based estimates, relatively small fractions of reservists with earnings losses—holds across all activation patterns and groups of reservists.

There are a number of reasons why our estimates of earnings loss attributable to activation differ from estimates based on survey data. First, a considerable portion of the military earnings of activated reservists is tax-preferred. However, the surveys typically instruct reservists to report pretax earnings. In contrast, our estimates explicitly include an estimate of the value of the tax preference. We estimate that the value of the tax advantage accounts for close to one-third of the mean gain in earnings experienced by activated reservists. Second, the survey responses are categorical and self-reported and so likely measure earnings changes with substantial error and perhaps bias (Bound and Krueger, 1991). Our estimates are based on administrative data that measure earnings with great precision and without significant bias. Third, the survey questions refer to the most recent activation. Sometimes, those activations occurred several years earlier. For several reasons, our estimates suggest that earnings losses are less common for more recent activations. Finally, survey and item response rates in the most recent surveys (the SOFRC) are low, which raises the possibility that a selected sample of reservists is responding to these earnings loss questions.

Although our findings on earnings loss differ significantly from those based on available survey-based evidence, these findings are what might be expected given that the Department of Defense sets active duty pay above mean full-time pay of civilians with similar education and experience (OSD/P&R, 2002). Moreover, reservists serving on active duty often receive special pays, allowances, and tax breaks in

addition to regular military compensation. Thus, while regular military compensation is above mean civilian wages, total compensation when activated is often much higher.

Results for 2004

Civilian earnings data for 2004 are not yet available, but military earnings data for that year are available. Using a method similar in spirit to that described and employed in Klerman, Loughran, and Martin (2005), we assess whether reservists activated in 2004 are likely to have significantly different experiences with respect to earnings gains and losses than reservists activated in 2002 and 2003. We conclude from this analysis that the finding of substantial average earnings gains among activated reservists is likely to hold when civilian-earnings data for 2004 become available.

The Effect of Activation on Postactivation Earnings

As reservists return from long periods on active duty, policy interest will shift to the effect of active-duty service on earnings following the period of activation. Our ability to analyze the effect of activation on postactivation earnings is limited by lack of data on civilian earnings beyond 2003. Nonetheless, for a sample of reservists activated for 0–30 days in 2000 and 2003 and more than 30 days in 2001 and 2002, we find little evidence that activated reservists suffer earnings losses following activation. On average, net earnings increase between 2000 and 2003 for reservists activated for more than 30 days in 2001 and 2002, and the net probability that a reservist experiences an earnings loss declines slightly. We emphasize, however, that these results apply to a select group of reservists and, therefore, should be viewed with some caution.

Implications for Policy

Supporters of congressional proposals to directly replace lost earnings of reservists who hold civilian jobs in the federal government and provide tax breaks to private-sector employers who do the same for their

reserve employees argue that these proposals would enhance equity and help DoD meet enlistment and retention goals. Their equity argument posits that reservists should not suffer serious financial harm as a result of their reserve service and so should be compensated for their financial losses. Our results indicate that this particular inequity is suffered by far fewer reservists than is suggested by available survey data.

In addition, we note that efforts to replace earnings of reservists who experience an earnings loss while activated will compensate some reservists who would have experienced an earnings loss even if they had not been activated. Compensating these reservists for losses they would have incurred regardless would not be perceived as fair to other reservists who did not experience an earnings loss simply because their base year earnings happened to be relatively low. Moreover, reservists whose earnings would have increased by an even larger amount had they not been activated would not be compensated for their implicit losses.

These findings do not mean that existing reserve compensation is sufficient to maintain the desired reserve force. Even though our estimates suggest that most reservists experience substantial earnings gains, those gains might not be sufficient to compensate reservists for the hardship of activation. The potential pecuniary costs of being activated (e.g., expenses associated with being away from one's family, possible loss of spousal earnings, a decline in earnings following activation), as well as the nonpecuniary costs of being activated (e.g., emotional cost of family separation, risk of injury), can be substantial; it is unclear whether the increase in earnings for the average reservist we estimate here will be enough to offset those costs.

More broadly, we should expect that in the future, enlistment and reenlistment in the reserves will be positively correlated with potential earnings gains (or negatively correlated with potential earnings losses). To some extent, the departure from the reserves of reservists with the potential for significant earnings losses is beneficial. Reservists who stand to suffer large losses, like maybe the self-employed or individuals who command large civilian salaries, may not be a good match in aggregate for a reserve force that DoD wishes to use with some fre-

quency. However, inasmuch as these individuals possess specific skills that are particularly valued by the reserves, additional targeted compensation may be appropriate.

Future research should consider what kind of compensation reforms are likely to be most cost-efficient in attracting and retaining reservists in an era in which the probability of activation is substantially above historical norms. Whatever the mechanism, it is likely that the most cost-efficient compensation mechanisms will target groups of reservists experiencing particularly low rates of reenlistment who DoD wishes to retain. These reservists may or may not be reservists that happened to have experienced an earnings loss when activated.

Acknowledgments

This document was made possible by the support and cooperation of staff in the Social Security Administration (SSA), Defense Manpower Data Center (DMDC), and the Office of the Assistant Secretary of Defense for Reserve Affairs (OSD/RA).

Mike Risha at SSA expedited the processing of the formal contract for access to the data, patiently explained what data were available and how we could use them, and executed our analysis programs promptly.

At DMDC, Scott Seggerman provided data promptly, answered questions, and facilitated the transfer of data to SSA. Other staff at DMDC helped with individual files. They include Barbara Balison (Contingency Files), Darlena Ridler (Active Duty Pay Files), and Christi Phillips (Reserve Pay Files).

We greatly appreciate the support of our sponsors in Reserve Affairs who were actively involved in developing the analysis plan for this project and in shaping this document. They include Dr. John Winkler, Deputy Assistant Secretary of Defense for Reserve Affairs (Manpower and Personnel); Tom Bush, current Principal Director, Manpower and Personnel, and previous Director, Program Integration Office (also in Manpower and Personnel); Virginia Highland, Office of the Assistant Secretary of Defense for Reserve Affairs; Richard Krimmer, Director of Military Personnel Programs, Office of the Assistant Secretary of Defense for Reserve Affairs; and Captain Michael Price, Assistant

Director of Military Personnel (Compensation) and Coast Guard Liaison to the Office of the Assistant Secretary of Defense for Reserve Affairs.

At RAND, we have benefited from the support and guidance of the previous Director of the Forces and Resources Policy Program (FRP) in the National Defense Research Institute, Susan Everingham. She brought the project to RAND and selected us to lead it. We have also benefited from the support and guidance of her successor, Jim Hosek, and the associate director of FRP, Meg Harrell.

In addition, we have benefited from the comments of our colleagues at RAND at an internal FRP seminar. Beth Asch and Harry Thie provided helpful reviews of an earlier report and this document. Bogdan Savych, Brian Maue, and Jennifer Kavanagh have provided excellent research assistance throughout. Paul Steinberg provided editorial support. Christopher Dirks provided help with formatting the manuscript.

Acronyms

ADD	Active-Duty Days
ADPF	Active-Duty Pay File
ADT	Active-Duty Training
AFQT	Armed Forces Qualifying Test
AGR	Active Guard and Reserve
ANG	Air National Guard
ARNG	Army National Guard
BAH	Basic Allowance for Housing
BAS	Basic Allowance for Subsistence
BP	Basic Pay
CPI-U	Consumer Price Index-All Urban Consumers
CZTE	Combat Zone Tax Exclusion
DMDC	Defense Manpower Data Center
DoD	Department of Defense
EITC	Earned Income Tax Credit
FICA	Federal Insurance Contribution Act
FRP	Forces and Resources Policy Program
FSA	Family Separation Allowance
GAO	U.S. General Accounting Office
GWOT	Global War on Terrorism
HFP	Hostile Fire Pay
IDT	Inactive Duty Training
MEF	(SSA) Master Earnings File
OASDI	Old Age, Survivors, and Disability Insurance

ODS/ODS	Operation Desert Shield/Operation Desert Storm
OIF	Operation Iraqi Freedom
ONE	Operation Noble Eagle
OSD	Office of the Secretary of Defense
OSD/P&R	Office of the Under Secretary of Defense for Personnel and Readiness
OSD/RA	Office of the Assistant Secretary of Defense for Reserve Affairs
PCS	Permanent Change of Station
PME	Professional Military Education
QRMC	Quadrennial Review of Military Compensation
RA	Reserve Affairs
RCS	Reserve Component Survey
RMC	Regular Military Compensation (the sum of Basic Pay, Basic Allowance for Housing, Basic Allowance for Subsistence, and Tax Advantage)
RPF	Reserve Pay File
SOFRC	Status of Forces Survey of Reserve Component Members
SSA	Social Security Administration
SSI	Supplemental Security Income
TDY	Temporary Duty
USAFR	Air Force Reserve
USAR	Army Reserve
USD	Undersecretary of Defense
USERRA	Uniformed Services Employment and Reemployment Rights Act
USMCR	Marine Corps Reserve
USNR	Naval Reserve
VHA	Variable Housing Allowance
WEX	Work Experience File
WLS	Weighted Least Squares

CHAPTER ONE

Introduction

In support of the ongoing Global War on Terrorism (GWOT), over half of the reserve force has been activated; the typical activation has been involuntary and lasted a year or more. For two reasons, the possibility that reservists might suffer financial losses during periods of activation is a subject of considerable concern to the reserve community, policymakers, and the public.[1] Specifically, what we call the "equity perspective" posits that reservists serving in harm's way should not also be subject to significant financial harm. In addition, what we term the "compensation perspective" posits that actual and expected financial losses during and after activation might discourage reservists from reenlisting and potential reservists from enlisting.

In this Introduction, we provide background information on trends in reserve activations over the 1990s and during the GWOT, discuss why changes in the role the reserves play in national defense could impact compensation policy, review existing survey-based evidence on how activations affect earnings, and discuss recent congressional proposals that seek to compensate reservists for earnings losses attributable to activations.

[1] See, for example, the *New York Times* editorial "Part-time Pay for Full-time Service" (March 10, 2005).

Background

Over the last decade, a confluence of factors has transformed the Total Force Policy vision of the early 1970s, which called for integrated use of the active and reserve components, from vision into reality.[2] Despite the doctrinal shift called out in the Total Force Policy vision, the reserves continued to be viewed during the 1970s and early 1980s as a follow-on force (i.e., a strategic reserve) in the event of an extended conflict. Many reserve units were structured with fewer personnel and less equipment than they would deploy with under the assumption that an extended conflict would permit time to supply these units with additional personnel, equipment, and training as needed (U.S. GAO, 2004a [GAO-05–21]). Consistent with this view, the reserves were used infrequently (less than one million duty days in the late 1980s, as shown in Figure 1.1).

The first major mobilization of the reserves since the Korean War occurred in support of Operation Desert Shield/Operation Desert Storm (ODS) in 1991. As a result of ODS, the number of active duty days contributed by the reserve forces increased from under one million in 1989 to more than 44 million in 1991. Following ODS, utilization of the reserves dropped sharply, but remained well above previous levels (as shown in Figure 1.1). During the 1990s, reservists participated in a number of peacekeeping and other contingencies, including operations in Haiti, Bosnia, Southwest Asia, and Kosovo. By fiscal year (FY)00, reservists were contributing 12.7 million active-duty days to the Total Force.

The events of September 11, 2001, and the ensuing GWOT (as embodied in Operations Noble Eagle, Enduring Freedom, and Iraqi Freedom) led to a second major mobilization of the reserves. During FY03, reservists contributed approximately 63 million active-duty days in support of the GWOT, five times FY00 active-duty days and half again as large as the active-duty days during the First Gulf War. The duration of the average reserve activation during the GWOT has also been long by historical standards. Between September 2001 and

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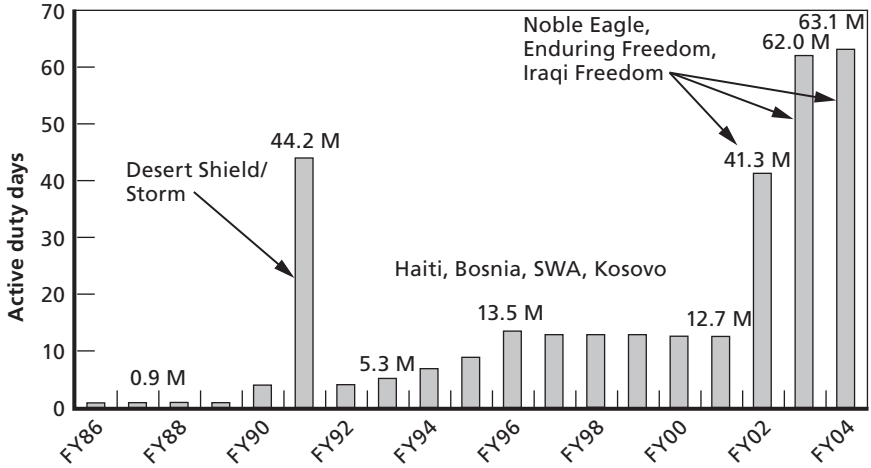
[2] For a broader discussion of the recent history of the reserves, see Rostker (1992, Chapter 3). For more discussion of recent utilization of the reserves and the ongoing changes to the reserves, see http://www.defenselink.mil/ra/documents/dodtotalforce.pdf (2006).

Figure 1.1
Reserve Activations



SOURCE: Reproduced from unpublished figures created by OSD/RA.
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December 2004, the average reserve activation had lasted eight months. Moreover, this figure underestimates the average completed duration. It combines both the length of completed service on active duty with the length of time on active duty for those whose activation is not yet complete (a large group of people in late 2004). The average length of complete spells will, thus, be even longer. About 21 percent of activated reservists (some 73,000 reservists) had been activated more than once since September 11, 2001.[3]

DoD policy implies that levels of utilization of the reserves higher than the pre-GWOT period will continue into the indefinite future. Current DoD policy envisions a Total Force in which the reserve components are fully integrated with the active-duty force and activated much more frequently than in the past. As a result, the probability that

[3] These figures are compiled from a December 2004 extract of DMDC's Global War on Terrorism Contingency File.

any given reservist will be activated is much higher today than at any time during the Cold War, and those who are activated are likely to serve for a longer period of time.

This shift in defense policy has been explicit since the late 1990s and is reflected in official DoD policy statements. For example, in framing the results of the 1999 Ninth Quadrennial Review of Military Compensation (QRMC), the *Reserve Personnel Compensation Review* (OSD/P&R, 2004, p. 7) stated that the reserve components:

> . . . are no longer just a pre-trained manpower pool to be used in the event of full mobilization, but are now more fully integrated into missions that require less than full mobilization and are subject to more frequent call-ups.

Similarly, Lieutenant General James R. Helmly, Chief, Army Reserve, stated in testimony before the Senate Subcommittee on Personnel, Committee on Personnel (March 31, 2004, p. 16): "We are committed to achieving a capability ratio that will manage Army Reserve deployment to once every four or five years."

Implications for Compensation of the Changing Role of the Reserves

This increased likelihood of being activated, and of being activated for extended periods, is of concern for two reasons. The first reason is related to equity or fairness. Activated reservists make many sacrifices in serving their country. They are separated from their families and everyday life and put in harm's way. The equity concern posits that they should not be subject to significant financial harm as well.

When activation was relatively rare and often voluntary, the financial well-being of reservists and their families during periods of activation received little attention from DoD or the public.[4] Now, however,

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[4] For example, there is no discussion of income while mobilized in Grissmer and colleagues (1989). See also the comments in Asch (1996). Concern over earnings loss during the First Gulf War led to the creation of the Ready Reserve Mobilization Income Insurance Program (RRMIIP) in February 1996. Reservists were offered the option of purchasing up to $5,000 per month of insurance against income loss. For a variety of reasons, this program was not financially sustainable and was terminated in November 1998. See OSD/RA, 2004, for more on the history of RRMIIP.

with hundreds of thousands of reservists activated, many serving for a year or more at a time and many more being activated multiple times, there is considerable concern within DoD and among the public at large that reservists are being treated unfairly.[5]

The second reason to be concerned about the impact of activation on earnings is that actual and expected income losses during and after activation might cause some reservists to leave the reserves earlier than planned and may cause some potential reservists never to enlist. Both Congress and DoD are concerned about how activations could affect the overall supply of reservists. To this end, in 2003, Congress directed DoD to conduct a comprehensive review of compensation for reserve personnel.[6] The charge for that directive stated:

> The committee recognizes that the contributions of the reserve components have greatly increased in the past decade. In particular, there are certain mission-critical skills and units among reserve forces that have been recalled for contingency operations, placing stress upon the members and their families. The role of the reserves is so integral in the total force that military operations involving major, extended missions are required to include reserve participation.
>
> The committee is concerned that the pay and benefits of reserve personnel must appropriately compensate them for their service. Today's total force concept, which relies heavily on National Guard and Reserve forces for both day-to-day and contingency operations, differs from that envisioned by the designers of the reserve compensation and retirement system more than a half-century ago. Accordingly, the committee directs the Secretary of Defense to conduct a reserve personnel compensation review aimed at determining the extent to which personnel and compen-

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[5] For example, see "When Duty Calls, They Suffer," *USA Today,* April 17, 2003; "Reservists Under Economic Fire," *USA Today,* April 22, 2003; "Reservists Pay Steep Price for Service," *USA Today,* June 9, 2003.

[6] The request can be found in Senate Report 107–151 that accompanied the National Defense Authorization Act for Fiscal Year 2003. The original committee language can be found at http://thomas.loc.gov/cgi-bin/cpquery/?&db_id = cp107&r_n = sr151.107&sel = TOC_563910&. DoD's report is available as: "Reserve Personnel Compensation Program Review," OSD/P&R, March 15, 2004, http://www.defenselink.mil/ra/documents/rccompensation.pdf.

sation policies and statutes, including the retirement system that defers eligibility for retired pay to age 60, appropriately address the demands placed on guard and reserve personnel.

What the Available Evidence Says about Income Loss from Activation

The concerns of policymakers and others about income loss attributable to activation are based largely on estimates of income loss derived from DoD survey data and on anecdotal evidence reported in the popular press.[7] Based on the 2000 Reserve Component Survey (RCS), for example, U.S. GAO (2004b) reports that 41 percent of reservists stated that their most recent activation (which at that time, was before September 11, 2001) led to an income loss; 30 percent of these reservists reported no change in income; and 29 percent reported an increase in income. About 10 percent of these reservists reported a total income loss of more than $5,000.

U.S. GAO (2004b) also includes self-reported income loss figures from the 2002 Survey of Spouses of Activated Reservists. Reported income losses in this survey are somewhat larger. Spouses reported that 14 percent of families experienced monthly income losses of more than $2,000 and another 14 percent experienced monthly income losses of $500 to $2,000. However, 12 percent experienced no change in family income and a majority—59 percent—experienced an increase in family income. In 22 percent of families, the reported increase in family income was more than $1,000 per month. In another 16 percent of the families, the reported increase was $500 to $1,000. These survey estimates suggest considerable heterogeneity in individual and family income loss, including large losses for a substantial subset of activated reservists.

More recent earnings loss estimates incorporating the experiences of reservists serving on active duty during the GWOT are similar. Responses to the May 2004 Status of Forces Survey of Reserve

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[7] For example, see "When Duty Calls, They Suffer," *USA Today,* April 17, 2003; "Reservists Under Economic Fire," *USA Today,* April 22, 2003; "Reservists Pay Steep Price for Service," *USA Today,* June 9, 2003.

Component Members (SOFRC) indicate that 49 percent of activated reservists report some earnings loss, 43 percent report an earnings loss of 10 percent or more, and 21 percent report an earnings loss of 20 percent or more.[8]

In contrast, Doyle and Gotz (2005) take a more indirect approach to analyzing earnings loss among activated reservists. That study uses DMDC data to compute median military earnings while activated by education and civilian occupation and then compares those values to median civilian earnings in those same education and occupation groups derived from the 2000 Census. In so doing, they implicitly assume that activated reservists are identical (with respect to civilian earnings) to civilians with the same education and civilian occupation and that reservists receive no civilian pay while serving on active duty. With this method, Doyle and Gotz (2005) conclude that: "Median civilian earnings in most occupations—representing a large majority of reservists—were less than median military incomes while on active duty" (p. S-1), that is, earnings would rise with activation.

Congressional Proposals in Response to the Survey-Based Evidence

Responding to the available survey-based evidence showing large earnings losses for a sizable fraction of activated reserves, a number of congressional proposals have sought to increase the earnings of activated reservists through direct compensation, tax breaks, and increases in other benefits (e.g., educational benefits, retirement benefits). Many of these proposals also sought to compensate reservists directly for earnings losses attributable to activation. (See Appendix A for a list of bills introduced to Congress as of September 2005 offering earnings replacement or tax credits to employers who offer earnings replacement.) For example, the Hope at Home Act (H.R. 838) would require the federal government to make up the difference between civil service pay and

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[8] Authors' estimates. We restrict the SOFRC sample to reservists who are not currently serving in the Active Guard and Reserve (AGR) and who reported being activated in the past 24 months. This reduces the sample from 20,724 to 11,063 observations. Of these remaining observations, 8,217 reported earnings information such that we could compute monthly earnings before and during the respondent's most recent activation. Please refer to DMDC (2005) for more on the May 2004 SOFRC.

military pay for federal employees. That proposal would also offer a 50 percent tax credit (up to $30,000) for private-sector employers who pay reservists the difference between nonactivated and activated earnings while the reservist serves on active duty.

In their letter to their colleagues dated April 12, 2005, Representative Thomas Lantos and the other cosponsors of the Hope at Home Act cited both equity and compensation-based arguments for their legislation. Reflecting an equity perspective, they argued:[9]

> Clearly the citizens who enlist in the Guard and Reserves do so because of an admirable sense of patriotism to our country. The financial security of their family should not be jeopardized because of their service to our country.

Reflecting a compensation perspective, they argued:

> Failure to ensure the financial security for these brave men, women, and their families is a significant roadblock to retention and recruitment for the Guard and Reserves.

In January, 2006, Congress passed and President Bush signed into law the FY2006 National Defense Authorization Act (NDAA). The NDAA includes provisions to replace lost earnings of reservists who were activated since January 2006 for a period of more than 18 months, who have completed 24 months on active duty during the previous 60 months, or who are involuntarily mobilized for service on active duty for a period of 180 days or more within 6 months or less following the member's separation from a previous period of involuntary active duty for a period of 180 days or more. The law specifies that differences in earnings are to be computed based on pretax earnings.

These congressional proposals are motivated, in part, by estimates of earnings loss generated from survey data. But, for several reasons, these survey-based estimates of earnings loss are problematic. First, the survey responses are categorical and self-reported and so likely measure

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[9] "Defense Department Survey Shows That Pay Gap Problem More Severe Than Initially Thought," Letter to Congress from Representative Lantos, April 12, 2005.

earnings changes with substantial error and perhaps bias.[10] Second, the earnings concept employed in these surveys is imprecisely defined. For example, the surveys typically do not specify a period of time over which respondents should compute earnings changes and respondents may be confused about what to include in their earnings figures. Third, the most recent SOFRC surveys explicitly instruct reservists to report pretax earnings. However, a considerable portion of the military earnings of activated reservists is tax-preferred. Thus, considering only pretax earnings yields an upwardly biased measure of earnings loss. Finally, survey and item response rates in the most recent surveys (the SOFRC) are low, which suggests the possibility that a selected sample of reservists is responding to these earnings loss questions.[11]

Citing these and other concerns with survey-based evidence, U.S. GAO (2004b) concluded:

> DoD lacks sufficient information on the magnitude, the causes, and the effects of income change to determine the need for compensation programs targeting reservists who
>
> (1) fill critical wartime specialties,
> (2) experience high degrees of income loss when on extended periods of active duty, and
> (3) demonstrate that income loss is a significant factor in their retention decisions.
>
> Such data are critical for assessing the full nature and scope of income change problems and in developing cost-effective solutions.

As a result, the GAO recommended:

> . . . that the Secretary of Defense direct the Under Secretary of Defense for Personnel and Readiness to determine the need for compensation programs aimed at addressing reservists' income

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[10] This problem is not unique to these particular surveys. For example, see Bound and Krueger (1991) and Bollinger (1998), for an analysis of measurement error in self-reported earnings in the Current Population Survey.

[11] About 37 percent of eligible reservists responded to the May 2004 SOFRC (DMDC 2005).

> loss during periods of active duty by obtaining more complete information on the magnitude of income change, the causes of income change, and the effects of income change on reserve retention.

Consistent with this recommendation, the FY05 National Defense Authorization Act directed DoD to conduct a survey of members of the reserve components activated in support of the GWOT to determine the extent to which reservists sustained a reduction in monthly income during their period of active service. The survey is to include at least 50 percent of reservists activated over this period. Results from that survey, conducted in May 2005, were not available at the time of the writing of this report, but a review of the survey instrument suggests those survey results are likely to be subject to many of the measurement issues discussed above.

Study Objective

This study relies on administrative earnings data from SSA and DMDC to estimate how activation affects the earnings of reservists. Using administrative data rather than survey data avoids the problems with survey-based estimates noted above.[12] First, the administrative earnings data we employ are of very high quality. No other source of earnings data is likely to measure earnings as precisely as the sources we employ here. Second, we precisely define what is and what is not included in our measure of earnings. Third, we use these data to approximate the value of the tax advantage accorded many military pays and allowances. Finally, our sample sizes are very large. Our data include individual-level data on earnings for every year between 2000 and 2003 for virtually all reservists serving during that time. These

[12] One limitation of using administrative earnings data is that these data might not include all civilian earnings. A very small fraction of civilian earnings are legally excluded from Social Security (less than 10 percent). An unknown fraction of earnings are illegally not reported to SSA. Self-reported earnings might also fail to include some sources of earnings.

large sample sizes allow us to reliably estimate earnings effects for a variety of activation patterns and subgroups of interest.

Organization of the Document

The balance of this report describes our methods and results. The next chapter (Chapter 2) describes the sources of data we use to construct our database of earnings and activations and precisely how we measure both of these concepts. We then present our results in four chapters. In Chapter 3, we present the "gross effect"—defined as the simple difference in mean earnings between years activated and years not activated. Chapter 4 introduces and reports estimates of what we call the "net effect" of activation on earnings—defined as the difference between earnings when activated and an estimate of earnings in that same year had the reservists not been activated. Chapter 5 reports estimates of the fraction of reservists who experience an earnings loss. At the time of this report, SSA earnings data were available only through calendar year 2003. Chapter 6 employs an alternative estimation strategy that allows us to compute earnings losses attributable to activations in 2004. Chapter 7 presents early results on the effects of activation on earnings following deactivation. The final chapter summarizes our findings, suggests how they inform the current policy debate about reserve activations and earnings, and suggests directions for future analyses.

Some Notes on Language

We conclude this opening chapter with a description of terminology employed in this document.

We use the term "reserves" and "reservist" to refer to Selected Reservists serving in all components of the reserves (but not the Coast Guard Reserve).[13]

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[13] The Selected Reserve excludes members of the Individual Ready Reserve and the Inactive National Guard.

As will be made clear in the next chapter, we measure activation based on receipt of active-duty pay. Almost all reservists receive some active-duty pay every year for their annual two weeks of Active-Duty Training (ADT). Even in peacetime, though, many reservists serve more than 14 days on active duty. In our data, most longer activations are in support of the GWOT, but some activations are likely to be in support of other contingencies. Some activated reservists are deployed to a location away from their home base, but some serve close to home. Throughout, we analyze earnings effects according to time on active duty, regardless of why or where a given reservist is serving on active duty.

Finally, the overwhelming share (83 percent) of reservists is male (*2005 Reserve Forces Almanac*, February 2005). For simplicity of language, we refer to reservists using a male pronoun (e.g., "he," "his"). Unless we explicitly note otherwise, all such references should be understood to include female reservists.

CHAPTER TWO

Data and Methods

Our approach to estimating how activation impacts earnings requires a database that includes three elements: time on active duty, military earnings, and civilian earnings. In the most general terms, we construct such a database by merging information on time on active duty and military allowances from DoD administrative data and information on civilian earnings and military pay from SSA. Additionally, we use this information to impute a value to the tax preference accorded to some military compensation (Table 2.1). This chapter provides detail on our data sources, how we process the data, and our final sample sizes.

Earnings Concept and Data Sources

We define our concept of interest as annual after-tax equivalent cash compensation. We approximate that concept of interest as the sum of four components:

- *Civilian Earnings:* Civilian earnings include all nonmilitary earnings subject to Medicare taxes. We obtain data on annual earnings from SSA's Master Earnings File (MEF). SSA uses earnings data recorded in the MEF to compute Social Security benefits and to compute Social Security and Medicare taxes.[1] Almost all

[1] Social Security benefits include old-age, survivors, and disability insurance (OASDI) and supplemental security income (SSI).

Table 2.1
Components of Total Earnings, Data Sources, and Tax Treatment

Compensation	Reported in		Tax Advantage	
	MEF	RPF/ADPF	Noncombat	Combat
Civilian earnings	Yes	No	No	No
Active Duty Basic (military) pay	Yes	Yes	No	Yes
Drill pay	Yes	Yes	No	No
Hostile Fire pay	No	Yes	No	Yes
Bonuses	No	Yes	No	Yes
Other military pays	No	Yes	No	Yes
BAH (Basic Allowance for Housing)	No	Yes	Yes	Yes
BAS (Basic Allowance for Subsistence)	No	Yes	Yes	Yes
FSA (Family Separation Allowance)	No	Yes	Yes	Yes
Other allowances	No	Yes	Yes	Yes

NOTE: SSA Master Earnings File (MEF); DMDC Reserve Pay File (RPF); DMDC Active Duty Pay File (ADPF).

U.S. employment and earnings are subject to Medicare taxes.[2] SSA earnings records have been used in many empirical studies, including several studies related to the military (for example, Angrist, 1990, 1998; and Angrist and Krueger, 1994). The specific measure of earnings we employ from the MEF is Medicare earnings.

- *Military Pay:* Military pay includes all military pays (e.g., Basic Pay [BP], Hostile Fire Pay [HFP]) and bonuses. Of these pays, only basic pay is reported to SSA and included in the earnings measure we obtain from the MEF. We compute the value of pays other than basic pay from DMDC's Reserve Pay File (for all unactivated reservists and activated Army and Air Force reservists) and from DMDC's Active-Duty Pay File (for activated Navy and Marine reservists). Appendix B provides an overview of the military pays of greatest importance for this analysis and recent changes in those pays.

[2] See http://www.ssa.gov/OP_Home/cfr20/404/404–0000.htm for a list of employment categories that are exempt from Medicare taxes. Unlike Social Security earnings, Medicare earnings are not capped at the Social Security taxable limit.

- *Military Allowances:* Military allowances include all military allowances (e.g., Basic Allowance for Subsistence [BAS], Basic Allowance for Housing [BAH], Family Separation Allowance [FSA]). Allowances are computed from DMDC's Reserve Pay File (for all unactivated reservists and activated Army and Air Force reservists) and from DMDC's Active-Duty Pay File (for activated Navy and Marine reservists). Appendix B also provides an overview of the military allowances of greatest importance for this analysis and recent changes in those allowances.
- *Tax Advantage:* Military allowances and all military pays received while serving in a combat zone are not subject to federal income taxes (Table 2.1). To allow for a consistent comparison of earnings when activated and not activated, we use tax tables to impute taxable-equivalent earnings.[3] The tax imputations assume that the reservist files as single with no dependents and account for all federal income taxes and Social Security taxes.[4] The imputations do not account for state taxes. Military allowances and the value of pay subject to the Combat Zone Tax Exclusion (CZTE) are reported in the Reserve Pay File and in the Active-Duty Pay File.

We compute total earnings by summing Medicare earnings, military pays and bonuses other than basic pay, military allowances, and the imputed value of the tax advantage. We measure earnings on a calendar-year basis. Subannual data would be preferable, but earnings data from SSA are only available on an annual basis. Furthermore, the tax advantage is an annual concept. All dollars are converted to $2004 using the Consumer Price Index (CPI-U).

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[3] Technical details of our approach to imputing the tax advantage and taxable-equivalent earnings can be found in Klerman, Loughran, and Martin (2005).

[4] The assumption that reservists file as single with no dependents is clearly not valid. However, the impact of this assumption on our tax imputations is likely to be small, on average. On the one hand, assuming reservists are unmarried means that spousal earnings do not affect the reservists' marginal tax bracket. All else equal, this assumption lowers estimated taxes. On the other hand, the assumption that reservists have no dependents reduces the number of exemptions the reservist can declare, which raises estimated taxes.

Data Processing

We form our sample from DMDC's Work Experience File (WEX). The WEX is generated from DMDC's Active-Duty Military Personnel Master File and Reserve Component Common Personnel Data System File and contains records for each active or Reserve member serving on or after September 30, 1990.[5] From this file, we determine current enlistment status, rank, unit, component, military occupation, age, and gender. For the period of our analysis (2000–2004), the WEX data are recorded monthly. To the WEX, we then merge information on military pay from the Reserve and Active-Duty Pay files (RPF and ADPF) and annual earnings data from the SSA's MEF.[6]

To preserve confidentiality, SSA generates statistics on earnings (e.g., mean earnings) for groups of individuals only. To accommodate this limitation, we group our data according to:

- *Active-Duty Days in the Base Year:* Computed by dividing active-duty pay received by the daily basic pay amount from the current pay table given observed rank and years of service. We then divide active-duty days into five groups: 0–30, 31–90, 91–180, 181–270, and 271 or more. Note that for most reservists, active-duty days include active-duty training (ADT) (usually two weeks during the summer), but not inactive-duty training (IDT) (usually two days per month).
- *Active-Duty Days in the Out Year:* Computed and grouped as above.
- *Component:* Six reserve components as indicated in the WEX: Army Reserve (USAR), Army National Guard (ARNG), Air Force Reserve (USAFR), Air National Guard (ANG), Naval Reserve (USNR), and the Marine Corps Reserve (USMCR).

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[5] The file contains transaction records back through 1975 for each service member present on or after September 30, 1990.

[6] The merging of the WEX and ADPF and RPF files occurred at RAND using pseudo-SSNs. The merging of SSA earnings data to this merged file occurred at SSA using SSN, name, gender, and birth date. Our extract of the WEX does not contain SSN, name, or birth date. DMDC appended this identifying information and forwarded it directly to SSA.

- *Rank:* As indicated in the WEX and defined in 2000: junior enlisted (E1–E4), senior enlisted (E5–E9), warrant officers (W1–W5), junior officers (O1–O3) and senior officers (O4–O6).

Our basic unit of analysis is an annual observation on each reservist in our sample between 2000 and 2004. Using RAND-provided programs, SSA staff computed the difference between earnings in an "out year" and a "base year" for each reservist. For our purposes, 2000–2002 serve as base years and 2001–2003 serve as out years. Differences in earnings were then averaged within various combinations of groups as defined above. For example, the output of the programs reports the mean difference in earnings between 2000 and 2003 for reservists serving 0–30 days in 2000 and 271 or more days in 2003. The output received from SSA contains the mean difference in earnings at all possible levels of disaggregation as defined by the groups listed above. To preserve the confidentiality of SSA earnings data, levels of disaggregation with too few observations are not reported. Other group-level statistics were also computed, such as median earnings difference and percentage with any earnings loss or gain.

There are many possible ways to disaggregate these differences in earnings across base and out years. To keep the discussion manageable and focused on policy-relevant results, we restrict our discussion in the main body of the report in three ways. First, we focus our presentation on reservists who served 0–30 days in the base year. We focus on reservists who served 0–30 days because that level of active-duty service is consistent with a typical level of active-duty service in years in which a reservist has not been mobilized for a specific contingency (i.e., two weeks active-duty training plus some additional days of training or active-duty service for miscellaneous events); thus, the earnings changes we estimate can best be interpreted as the change in earnings between a year in which a reservist served a typical level of active-duty service and years in which he did not. In Chapter 5, we provide additional tabulations of how our estimates vary by active-duty days served in the base year.

Second, we focus on 2000 as our base year. We chose 2000 as our base year because it is the last full year before the events of September 11,

2001. The U.S. economy was also still expanding in 2000 and so earnings in that year were not affected by the subsequent economic downturn. Finally, we present results for out years 2002 and 2003 only. We focus on these out years because reservists who served for more than 30 days in 2001 could have been mobilized for reasons other than the GWOT. To keep our results focused on the post-9/11 experience, we choose not to show results with 2001 as the out year. In Appendix D, we report additional results with 2001 and 2002 as base years. Our substantive conclusions with respect to activations and earnings do not change when we employ these alternate base years.

Sample Selection

Our initial sample consists of 1,564,102 reservists who, according to the WEX, were members of a reserve component at any time during the period January 1999 to November 2003 (the last month of available WEX data). We then drop 202,785 reservists from this sample who do not appear in the ADPF or RPF during our sample period and 190,202 reservists for whom there was no corresponding SSA earnings record during our sample period (Table 2.2). The number of dropped records is large given that everyone in the reserves should get reserve pay from one of the pay files and that their reserve pay should be reported to SSA as earnings. It appears that this results from failure to pass validation with SSA. Specifically, we pass to SSA the SSN as well as name, gender, and date of birth. If the name, gender, and date of birth information in SSA's records do not match the information provided, SSA does not return earnings information for that individual.

Table 2.2
Base Sample Restrictions

Sample Restriction	Dropped Records	Remaining Sample
Individuals serving in a reserve component anytime 1999–2003 (as indicated by the WEX)	0	1,564,102
Reservists with records in the RPF or ADPF	202,785	1,361,317
Reservists with SSA earnings records	190,202	1,171,115

Table 2.3
Annual Sample Sizes

		Dropped Observations		
Base Year	Start	No Military Earnings in Base Year	Regular AD in Base Year or Rank >06	Remaining Sample
2000	1,171,115	403,935	58,921	708,259
2001	1,171,115	397,018	51,372	722,725
2002	1,171,115	393,086	33,868	744,161
2003	1,171,115	412,703	41,374	717,038

From this main file, we then drop some observations in each year (Table 2.3). Specifically, we drop from our analysis file: (1) those receiving no military pay in a given base year, (2) those serving in the Active Duty force (not merely on active duty) during a given base year, and (3) those with a rank higher than O6 in the base year. (There are too few of these reservists to analyze.) Thus, the number of observations changes with the base year. For example, when comparing 2000 earnings with 2003 earnings, our analysis file contains 708,259 observations; when comparing 2001 earnings with 2003 earnings, our analysis file contains 722,725 observations.

Data Limitations

Our data restrict our analysis to the impact of activation on own labor earnings. Thus, our analysis does not consider a number of deferred and nonmonetary forms of compensation that are plausibly affected by activation. For example, activated reservists and their families are entitled to free health care. This is a potentially major cost savings for many reservists, since some reservists have no health insurance otherwise and other reservists with health insurance may pay for a significant share of the costs through premiums, copayments, and deductibles. The value of health benefits is likely to be higher for younger and more junior reservists who are less likely to have private health insurance and more likely to pay for it themselves. The value of this health benefit is poten-

tially offset by the need to change health care providers (e.g., if the reservist was previously in a health maintenance organization; see the discussion in U.S. GAO, 2004b).

In addition, our analysis does not account for the present value of potential future reserve retirement pay. Reservists receive credit toward their retirement for each day of active-duty service; thus, all else equal, periods of activation will raise the future value of their retirement benefits. However, few reservists actually collect reserve retirement pay, so this is unlikely to induce significant bias in our analysis (Asch, Hosek, and Clendenning, 2005). The effect of activation on the value of retirement pay is likely to be more important for more senior and experienced reservists.[7] Similarly, our analysis does not account for the value of any other in-kind benefits of military service. These include access to the Post Exchange (PX), MAC transportation, and other in-kind service.

On the other side, our analysis does not account for any direct effects of activation on household expenditures (e.g., higher babysitting costs, a handyman to do household repairs, storage costs for a car and other belongings). Nor does it account for the possible impact of activation on spousal earnings.[8] Finally, our analysis does not consider any nonmonetary costs or benefits of activations (e.g., the cost of being away from one's family and serving in a hostile environment).

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[7] Vested reservists receive retirement pay at age 60. Positive and high discount rates (Warner and Pleeter, 2001) will greatly diminish the present value of retirement pay for younger reservists.

[8] For evidence on the effect of deployments on spousal earnings during the First Gulf War, see Angrist and Johnson, 2000.

CHAPTER THREE

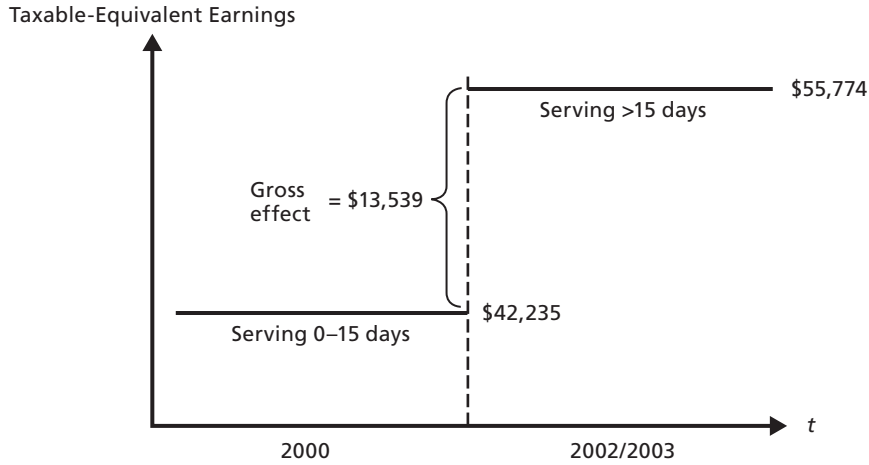
Gross Effect on Mean Earnings

We begin the presentation of our study results by examining what we call the "gross effect" of activation on earnings. The gross effect is the mean difference in earnings between a given out year and a given base year for some defined group of reservists. We illustrate this difference, using our actual data, in Figure 3.1 for reservists who served 0–30 days on active duty in 2000 (the base year) and more than 30 days on active duty in 2002 or 2003 (the out year), hereafter written simply as 2003.[1] For these reservists, mean earnings in 2000 were $42,235. For the same reservists, earnings in the out year averaged $55,774. The difference between these two numbers gives us the aggregate gross effect of activation, which is a gain of $13,539, or a 32 percent gain in mean earnings over earnings in 2000.

This chapter begins by examining how gross effects vary by days of active-duty service for the out year 2003. We then show how various components of military pay contribute to this gross effect. Gross effects for particular subgroups of interest (component, rank, and self-employed status) are presented next. Finally, we compare gross effects between out years 2002 and 2003 and argue that differences in the composition of reservists serving on active duty in those years, as well as differences in military pay, can account for the differences in gross effects by out year.

[1] Note that some reservists appear in this analysis file twice (e.g., those activated late in 2002 and serving into 2003).

Figure 3.1
The Gross Effect Concept



NOTE: ADD: Active-Duty Days. Figure is not drawn to scale.
RAND *MG474-3.1*

Gross Effects by Days of Active-Duty Service

Table 3.1 displays gross effects by active-duty days served in out year 2002/2003.[2] So for example, the last row gives the overall result plotted in Figure 3.1: $42,235 base-year earnings, $55,774 out-year earnings, yielding a gross effect of $13,539 ($55,774 – $42,235; about 32 percent).

The last column reports that this change is $132 per day.[3] The previous row (labeled "271+") gives the same statistics, but limiting the sample to those serving 0–30 days in 2001 and 271 or more days in 2002 or 2003 (e.g., the gross effect is a gain of $23,090).

The table makes clear that the mean gross effect increases strongly with days of active-duty service. This pattern appears to be largely attributable to an increase in out-year earnings with days of active-duty

[2] Note that anyone deployed for more than 30 days in 2002 and in 2003 contributes two observations to this table.

[3] We compute this statistic directly from the individual data. It is not computable from the entries in the table.

Table 3.1
Gross Effect and Gross Effect/Day, by Active-Duty Days, in 2002/2003

Active-Duty Days	Base-Year Earnings ($)	Out-Year Earnings ($)	Gross Effect ($)	Percent Change	Effect Per Day ($)
0–30	40,255	42,530	2,275	6	96
31–90	45,728	51,639	5,911	13	248
91–180	41,046	50,750	9,705	24	82
181–270	40,823	55,677	14,854	36	70
271+	40,058	63,148	23,090	58	74
31+	**42,235**	**55,774**	**13,539**	**32**	**132**

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000.

service, which is itself largely a function of more days of service rather than an increase in the gross effect per day. This is evident in the final column of Table 3.1, which shows the gross effect per day. With the notable exception of 31–90 active-duty days, the gross effect per active-duty day weakly declines with days of active-duty service. The large values for 31–90 active-duty days appear to be attributable to division of gross effects by small numbers (e.g., 1, 2) in that category. (Note that 31 active-duty days is equivalent to one day of active-duty service above the normal level of 30 days.) Finally, note the first row of the table. Even individuals activated in neither year have a modest earnings gain of 6 percent. This is not surprising. We expect earnings growth, especially for young people. In the next chapter, we consider a "net earnings change" concept that accounts for such expected earnings growth.

Disaggregating Gross Effects by Earnings Components

The results reported in Table 3.1 indicate that activated reservists on average experience substantial earnings gains. In this section, we show how the various components of earnings account for these gains. The top panel of Table 3.2 disaggregates base- and out-year earnings into three components—civilian earnings, military compensation, and the tax advantage—for reservists activated 0–30 days in 2000 and more than 30 days in 2002/2003.

Table 3.2
Components of Earnings

	Gross Earnings ($)		
	2000	2002/2003	Change
Total	42,235	55,774	13,539
Civilian	36,906	24,290	–12,616
Military	5,211	27,363	22,152
Tax advantage	119	4,122	4,003
Detail Military			
Basic pay	1,166	17,465	16,299
Drill pay	3,565	2,662	–903
BAS	57	573	516
BAH	204	5,230	5,026
FSA	0	566	566
HFP	5	350	346
Bonuses	188	264	76
Other pays	26	254	228

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and more than 30 days in 2002/2003.

In 2000, when this group of reservists served 30 days or less on active duty, their average civilian earnings were $36,906. As expected, their military compensation was minimal ($5,211), about 12 percent of total earnings. The tax advantage they received was very small ($119). These figures change sharply in 2002/2003, when this group of reservists served more than 30 days on active duty. Civilian earnings dropped to $24,290.[4] Military compensation ($27,363) now constitutes a large fraction of earnings and, since much of military compensation is tax free, the tax advantage is of considerable value ($4,122).

The bottom panel of Table 3.2 further disaggregates military compensation into various pays and allowances. The majority of military pay in 2002/2003 is composed of basic pay ($17,465). BAH is also large ($5,230), as is Drill Pay ($2,662). Other components include BAS,

[4] Civilian earnings could come from earnings of those reservists before being activated or after returning to civilian life in 2003, or from civilian employers who continue to pay their reserve employees while they serve on active duty.

FSA, HSP, and bonuses. However, individually none of these pays or allowances represents a significant portion of total pay. Together, they represent about 7 percent of total military compensation.

Thus, Table 3.2 shows that these activated reservists experience a decline in civilian earnings and lose some reserve drill pay, but these losses are more than offset by the increase in active-duty pay. Note that basic pay alone more than compensates for the loss of civilian earnings between the base and out year. When we add in BAH/BAS, various special pays and allowances, and the tax-advantaged nature of many military pays and allowances, note that some reservists might earn more when activated than when not activated. This is consistent with the Ninth Quadrennial Review of Military Compensation, which showed that Regular Military Compensation (RMC) for active-duty soldiers is above the median earnings of demographically similar civilians. Furthermore, activated reservists often receive sizeable pays, allowances, and tax advantages in addition to RMC.

Gross Effects by Reservist Characteristics

In this section, we examine gross effects by rank, component, self-employed status, and base-year earnings.

Rank and Component

Table 3.3 reports gross effects by rank and component for reservists serving 0–30 active-duty days in 2000 and more than 30 active-duty days in 2002 or 2003.[5] The structure of the table is similar to that of Table 3.1. There is a row for each rank and component group. The columns give the number of observations (i.e., reservists serving 0–30 active-duty days in 2000 and more than 30 days in 2002/2003), earnings in 2000 (the base year), the change in earnings (out year versus

[5] We do not report results for Warrant Officers serving in the Marine Corps since that group was composed of fewer than 50 observations and the statistical reliability of estimated means for that group is therefore questionable. The Air Force Reserve and Air National Guard do not employ Warrant Officers.

Table 3.3
Gross Effects by Rank and Component

			Earnings ($)			
Rank	Component	*N*	2000	2002/2003	Change	% Change
E1–E4	Army National Guard	51,431	22,797	33,707	10,910	48
E1–E4	Army Reserve	20,043	21,525	35,547	14,022	65
E1–E4	Air National Guard	8,688	23,241	35,563	12,322	53
E1–E4	Air Force Reserve	2,711	28,297	38,749	10,452	37
E1–E4	Marine Reserve	5,850	19,872	37,352	17,480	88
E1–E4	Naval Reserve	5,876	31,014	42,027	11,012	36
E5–E9	Army National Guard	45,164	40,731	51,767	11,036	27
E5–E9	Army Reserve	27,089	42,519	56,206	13,687	32
E5–E9	Air National Guard	24,834	50,460	60,168	9,708	19
E5–E9	Air Force Reserve	17,992	50,361	59,654	9,293	18
E5–E9	Marine Reserve	2,013	43,524	60,884	17,361	40
E5–E9	Naval Reserve	15,866	44,338	55,670	11,332	26
W1–W5	Army National Guard	2,333	67,503	83,084	15,580	23
W1–W5	Army Reserve	1,137	66,315	86,851	20,536	31
W1–W5	Naval Reserve	118	68,168	80,779	12,610	18
O1–O3	Army National Guard	6,061	57,278	78,341	21,063	37
O1–O3	Army Reserve	5,863	61,575	87,836	26,261	43
O1–O3	Air National Guard	1,394	70,959	95,996	25,037	35
O1–O3	Air Force Reserve	1,773	69,831	96,385	26,555	38
O1–O3	Marine Reserve	334	63,130	101,000	37,721	60
O1–O3	Naval Reserve	1,802	66,636	91,361	24,725	37
O4–O6	Army National Guard	2,820	81,673	102,000	20,446	25
O4–O6	Army Reserve	6,940	83,620	111,000	27,058	32
O4–O6	Air National Guard	2,157	102,000	123,000	21,506	21
O4–O6	Air Force Reserve	2,996	98,611	117,000	18,623	19
O4–O6	Marine Reserve	1,631	86,413	121,000	34,375	40
O4–O6	Naval Reserve	5,841	90,975	116,000	24,635	27

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and more than 30 days in 2002/2003. Rank is as of the base year (2000).

base year), and the percentage change in earnings (relative to the base year).

We make a number of observations from the results reported in Table 3.3. First, all groups experienced substantial average gains in

earnings when serving on active duty. The smallest earnings gain is over $9,000. Second, the number of reservists falling into these rank component subgroups varies widely. Not surprisingly, there are far more enlisted members than Officers or Warrant Officers and far more reservists serving in the Army Reserve and National Guard than in the other reserve components. In addition, while the Army components are relatively evenly balanced between junior enlisted members (E1–E4) and senior enlisted members (E5–E9), the Marine Reserve is much more junior and the Air Force and Navy components are much more senior. Third, average gross effects rise with rank, and percentage gains are largest for junior enlisted and junior Officers. Finally, independent of rank, reservists serving in the Marine Corps Reserve experience the largest earnings gains and reservists serving in the Air Force Reserve experience the smallest earnings gains.

The Self-Employed

Self-employed reservists are a population of particular concern to DoD and the public, because the businesses these individuals own could be particularly vulnerable to absences resulting from activation. In Table 3.4, we focus on the sample of reservists who reported any self-employment income to SSA in the base year (2000). These results suggest that the earnings of self-employed reservists on average increase substantially upon activation, although self-employed reservists serving 0–90 active-duty days experienced a mean decline in earnings.

Table 3.4
Gross Effects, by Self-Employed Status, Base-Year Earnings, and Active-Duty Days in 2002/2003

Active-Duty Days	Self-Employed	Not Self-Employed	2000 Earnings >$5k
0–30	–$7,400	$2,763	$1,256
31–90	–$1,525	$6,215	$5,206
91–180	$5,043	$9,778	$8,461
181–270	$16,774	$14,418	$13,060
271+	$28,887	$21,898	$20,308
31+	**$8,616**	**$13,693**	**$12,315**

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000.

Dropping Those Apparently Out of the Labor Force

Policymakers might be most interested in understanding how activation impacts the earnings of reservists exhibiting some minimal level of attachment to the traditional labor force. Some fraction of reservists are still in school, work in nontraditional sectors of the economy not covered by Social Security (either legally or illegally), are unemployed, or are otherwise not stably employed. The base year earnings of these individuals may not reflect their true earning potential and so, in some sense, underestimate their civilian earnings, which would therefore lead us to overestimate mean earnings gains.

Unfortunately, our data do not record school attendance, or hours or weeks of work. Instead, as a rough approximation, we reanalyze the data, dropping those "apparently out of the labor force," which we operationalize as annual earnings of less than $5,000. To address this concern, the fourth column of Table 3.4 reports results for the sample of reservists with civilian earnings of at least $5,000 in 2000. This level of earnings is about half of the annual earnings of a full-time worker at the federal minimum wage ($10,172 = $5.15 per hour × 40 hours × 52 weeks).

As expected, compared to the full sample, the mean gross effect is smaller in this subsample, but the difference is small ($13,539—the "Gross Effect" in the bottom row of Table 3.1—versus $12,315—the bottom right number in Table 3.4). This simple analysis suggests that the magnitude of the mean earnings change we estimate is not simply the result of extraordinarily low base-year earnings for reservists still in school, otherwise underemployed, or working in jobs that fail to report earnings to SSA.

Variation in Gross Effects by Out Year

Estimated gross effects increase considerably between out years 2002 and 2003 (Table 3.5). For example, the gross effect for reservists activated 0–30 days in 2000 and 271+ days in 2002 was $19,327 compared to $24,721 for reservists activated 0–30 days in 2000 and 271+ days in 2003. An increase in gross effects occurs in each category of active-duty days.

Table 3.5
Gross Effects, by Out Year and Active-Duty Days

Active-Duty Days	Base-Year Earnings ($)		Out-Year Earnings ($)		Gross Effect ($)	
	2002	2003	2002	2003	2002	2003
0–30	40,066	40,471	42,382	42,698	2,317	2,228
31–90	46,240	45,237	51,487	51,785	5,247	6,548
91–180	39,444	42,387	48,036	53,024	8,593	10,636
181–270	41,360	40,486	54,204	56,602	12,845	16,116
271+	43,628	38,510	62,955	63,232	19,327	24,721
31+	**43,416**	**41,426**	**53,880**	**57,073**	**10,465**	**15,647**

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000. Tabulations vary the out year (2002 or 2003), holding the base year fixed at 2000.

Computationally, there are two reasons why gross effects might vary by out year: (1) base-year earnings differ by year of activation, and (2) out-year earnings differ by year of activation. Base-year earnings vary between 2002 and 2003. The base-year earnings of reservists serving less than 181 days increased between $1,500 and $4,000 between 2002 and 2003, while the base-year earnings of those reservists serving 181–270 days was roughly constant and the base-year earnings of reservists serving 271+ days of active duty service declined by about $6,000.

Out-year earnings also vary between 2002 and 2003. In all but the highest category of active-duty days (271+), out-year earnings increased between 2002 and 2003. This increase in out-year earnings could be the result of a number of factors, including normal wage growth, changes in the military pay scale, frequency of receipt of special pays and tax advantage, and a change in the composition of reservists serving on active duty in 2002 and 2003.

One reason why base- and out-year earnings might vary by out year is that the composition of reservists who served on active duty during those out years varies. Table 3.6 shows that, in fact, the distribution of reservists serving on active duty by rank and component did change between 2002 and 2003. In our sample of reservists who served 0–30 days on active duty in 2000, about 54 percent serving on active duty in 2002 were members of the Army Reserve and National

Table 3.6
Distribution of Reservists by Component, Out Year, and Active-Duty Days (%)

Active-Duty Days	ANG (%)	AR (%)	AFG (%)	AFR (%)	MCR (%)	NR (%)
2002						
0–30	44	25	8	6	5	12
31–90	38	21	16	11	2	11
91–180	50	12	17	8	2	11
181–270	39	14	21	14	2	10
271+	23	16	21	15	5	19
31+	**37**	**17**	**18**	**12**	**3**	**13**
2003						
0–30	43	21	10	7	5	13
31–90	42	24	12	9	1	12
91–180	40	20	15	8	4	12
181–270	38	23	12	7	8	12
271+	43	33	6	7	4	6
31+	**42**	**26**	**11**	**8**	**4**	**10**

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000. Tabulations vary the out year (2002 or 2003), holding the base year fixed at 2000.

Guard, about 30 percent were members of the Air Force Reserve and Air National Guard, and about 3 and 13 percent were in the Marine Corps and Naval Reserve, respectively. With the advent of the Iraq War in 2003, the composition of reservists by component shifted toward the Army Reserve and National Guard; 68 percent of reservists serving on active duty in 2003 were members of the Army Reserve and National Guard.

This shift in composition is likely to affect our estimates of gross effects. Table 3.7 shows that members of the Army components are considerably more junior than members of the other reserve components. Furthermore, Table 3.3 suggests that gross effects increase with rank.

To compare effects across years without the effect of this shift in composition of the reserve force, we recompute the gross effects reported in Table 3.5 holding the distribution of reservists by rank and

Table 3.7
Distribution of Reservists by Rank Within Component

	E1–E4 (%)	E5–E9 (%)	O1–O3 (%)	O4–O6 (%)	W1–W5 (%)
ARNG	46	42	6	3	3
USAR	34	45	9	10	2
ANG	23	66	4	7	NA
USAFR	10	70	7	13	NA
USMCR	62	18	4	15	1
USNR	20	52	6	22	0

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and over 30 days in 2002/2003. Tabulations vary the out year (2002 or 2003), holding the base year fixed at 2000.

Table 3.8
Reweighted Gross Effects, by Out Year and Active-Duty Days

Active-Duty Days	Base-Year Earnings ($)		Out-Year Earnings ($)		Gross Effect ($)	
	2002	2003	2002	2003	2002	2003
0–30	41,893	41,827	44,146	43,882	2,253	2,055
31–90	41,604	42,229	46,458	48,628	4,854	6,399
91–180	40,458	42,160	49,143	52,688	8,686	10,528
181–270	40,755	41,289	54,503	57,412	13,748	16,123
271+	40,911	40,184	60,041	65,288	19,130	25,104
31+	**41,190**	**41,426**	**53,442**	**57,073**	**12,252**	**15,647**

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000. All figures are weighted according to the overall distribution of reservists by rank and component serving more than 30 days of active-duty service in 2003. Tabulations vary the out year (2002 or 2003), holding the base year fixed at 2000.

component constant at 2003 values (Table 3.8). These reweighted tabulations eliminate differences between 2002 and 2003 that result from changes in the distribution of reservists by rank and component.[6]

The results of this reweighting are striking in that it greatly reduces the difference in base-year earnings for reservists serving on

[6] Note also that this reweighting eliminates differences in gross effects across days of active-duty service attributable to differences in the distribution of rank and component across days of active-duty service. However, this reweighting has little impact on those results; gross effects increase strongly with days of active-duty service after reweighting.

active duty in 2002 and 2003 (i.e., the out year). Thus, observable differences between reservists serving on active duty in 2002 and 2003 account for much of the variation we observe in base-year earnings.

However, controlling for rank and component does little to affect differences in out-year earnings between 2002 and 2003. With the exception of reservists activated 0–30 days in 2002 or 2003, among those activated 0–30 days in 2000, earnings in 2002 are lower than out-year earnings in 2003, even after controlling for rank and component. One explanation for this difference is that the receipt of HFP, FSA, and the CZTE increased between 2002 and 2003 with the advent of the Iraq War.

Table 3.9 shows how average pay changed between 2002 and 2003 for reservists serving more than 30 days of active-duty service in those out years—reweighted to hold component, rank, and active duty fixed at their 2003 distribution. The mean value of FSA, HFP,

Table 3.9
Reweighted Civilian and Military Earnings, by Out Year: All Activations

	2002 ($)	2003 ($)
Total	53,442	57,073
Civilian	21,796	22,941
Military	27,811	29,399
Tax advantage	3,835	4,733
Detail Military		
Basic pay	18,089	18,974
Drill pay	2,330	2,474
BAS	1,093	334
BAH	5,381	5,753
FSA	261	825
HFP	134	512
Bonuses	302	234
Other pays	221	294

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and more than 30 days in 2002 or 2003. All figures are weighted according to the overall distribution of reservists by rank and component serving more than 30 days of active-duty service in 2003. Tabulations vary the out year (2002 or 2003), holding the base year fixed at 2000.

Table 3.10
Reweighted Civilian and Military Earnings, by Out Year: Activations of More than 270 Days

	2002 ($)	2003 ($)
Total	59,451	62,187
Civilian	9,616	9,330
Military	43,332	44,537
Tax advantage	6,503	8,320
Detail Military		
Basic pay	30,308	30,562
Drill pay	463	697
BAS	1,833	482
BAH	9,448	9,626
FSA	449	1,492
HFP	178	998
Bonuses	287	280
Other pays	365	400

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and more than 270 days in 2002 or 2003. All figures are weighted according to the overall distribution of reservists by rank and component serving more than 30 days of active-duty service in 2003. Tabulations vary the out year (2002 or 2003), holding the base year fixed at 2000.

and CTZE all increased between 2002 and 2003. Average basic pay increased by about $885 as well, reflecting both normal wage growth and changes in the military pay table.

This change in military compensation is even more striking for those serving 271 or more days in active duty. Table 3.10 reports equivalent results to those in Table 3.9 for this group (again weighted by the 2003 component and rank distribution).

Summary

This chapter has considered the gross effect of activation on mean earnings. On average, reservists experience substantial earnings gains when activated. Overall, reservists serving 0–30 days in 2000, and more than 30 days in 2002 or 2003, experienced a mean earnings gain of $13,539, or a gain of 32 percent over base-year earnings.

There is considerable variation in earnings gains across reservists. Earnings gains increase between 2002 and 2003 because of changes in military compensation between those years. Earnings gains also increase with days of active-duty service. For reservists serving more than 270 days on active duty in 2002 and 2003, mean earnings gains were $23,090, a gain of 58 percent over base-year earnings. We also find that earnings gains increase with rank and that there is some impact of component on earnings change independent of rank. Reservists serving in the Marine Corps experience the largest earnings gains and reservists serving in the Air Force Reserve experience the smallest earnings gains.

However, these gross effects incompletely characterize how activations impact earnings. First, these estimates do not account for what might have happened to the earnings of an activated reservist had that reservist never been activated (that is, we would expect reservists to experience some change in earnings regardless of whether they were activated). Our estimates should net out this change in earnings. In the next chapter, we compute such "net effects"—the change in earnings relative to what earnings would have been in the absence of activation.

Second, even though we estimate that reservists experience substantial mean gains in earnings, some fraction of activated reservists are nevertheless likely to experience a decrease in earnings. The focus of legislative proposals is clearly on reservists who lose income as a result of being activated and, even more so, on reservists who suffer large income losses because of activation (i.e., the left tail of the distribution of earnings changes). We consider the effect of activation on the probability a reservist experiences an earnings loss in Chapter 5.

CHAPTER FOUR

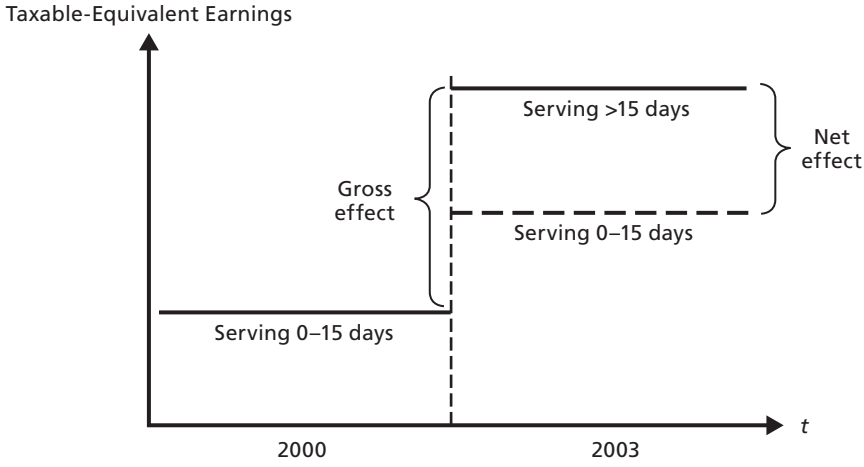
Net Effect on Mean Earnings

In the previous chapter, we reported what we refer to as gross effects, the difference between earnings in a base year and an out year. Ideally, though, we would like to answer the question: "How do the out-year earnings of a reservist differ from what that reservist's out-year earnings would have been in the same year had that reservist not been activated?" What earnings would have been had the reservist not been activated is what we refer to as "counterfactual" earnings. We refer to the difference between observed earnings when activated and counterfactual earnings as the "net effect" of activation on earnings.

The crucial insight here is that we would expect the earnings of reservists to change between the base year and out year even in the absence of activation. For example, on average, we would expect military earnings to increase as reservists gain years of service and rank. Similarly, on average, civilian earnings grow with age, since experience and job tenure tend to increase with age.

Figure 4.1 illustrates the "net effect" of activation on earnings we seek to estimate in this chapter. Suppose we observe the earnings of a set of reservists who served 0–30 days in 2000 and more than 30 days in 2003. We plot the earnings of this group of reservists before and during activation with solid lines. Now suppose we could also observe what the earnings of that same group of reservists would have been in 2003 had those reservists never been activated. We plot those "counterfactual" earnings using a dashed line. The figure assumes that these counterfactual earnings are higher than earnings in the base year of 2000, but this is not necessary. The net effect is labeled as the difference between earnings received when activated for more than 30 days

Figure 4.1
The Net Effect Concept



NOTE: ADD: Active-Duty Days.
RAND *MG474-4.1*

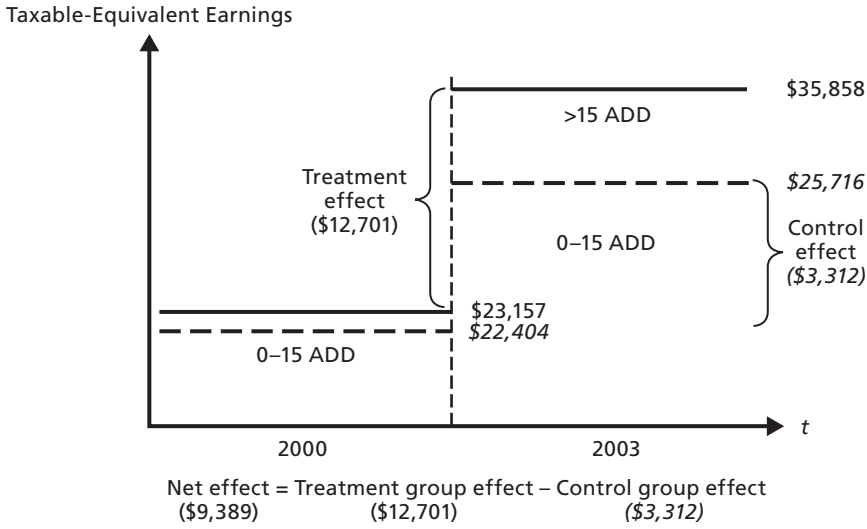
and the counterfactual earnings represented by the dashed line. The net effect then tells us how the earnings of activated reservists changed relative to what they would have been had they not been activated.

Computing the Net Effect

Of course, we do not directly observe what earnings would have been in the absence of activation. Instead, we must approximate them. We do so using the earnings of otherwise similar individuals (i.e., same rank and component) who were activated in neither the base year nor the out year (i.e., they served 0–30 days of active duty in both years). Following the language of the experimental design literature, we refer to this unactivated group as the "control" group. We refer to activated reservists as the "treatment" group.

Figure 4.2 provides an example of how we compute the net effect for a particular group of reservists: junior enlisted members of the Army National Guard serving more than 30 days on active duty in 2003. We

Figure 4.2
Computing the Net Effect



NOTE: ADD: Active-Duty Days. Figure is not drawn to scale. Control Group line dashed and figures in italics.

RAND *MG474-4.2*

plot earnings for the treatment group in the base year and out year with solid lines and we plot earnings for the control group in the base and out years with dashed lines. If the treatment and control groups were identical in all respects except for the fact that the treatment group was activated and the control group was not, base-year earnings for both groups would be the same. In practice, earnings for the treatment group and control groups differ (ideally and usually) slightly. In the particular case illustrated by Figure 4.2, the base-year earnings of the treatment group are $23,157 and the base-year earnings of the control group are $22,404.

Our estimate of the net effect assumes that, despite differences in base-year earnings between the control and treatment group, the *change* in earnings between the base and out years for the control group is a reasonable estimate of what the *change* in earnings of the treatment

Table 4.1
Sample Computation of Net Effects (for Junior Enlisted Members of the Army National Guard)

	Active-Duty Days		2000 Earnings ($)	2003 Earnings ($)	Diff. ($)
	2000	2003			
Treatment	0–30	31+	23,157	35,858	12,701
Control	0–30	0–30	22,404	25,716	3,312
Net	0–30	31+	753	10,142	9,389

NOTE: Sample restricted to junior enlisted members of the Army National Guard.

group would have been had the treatment group not been activated.[1] Thus, the net effect of activation on the earnings of junior enlisted members of the Army National Guard is the difference between the change in earnings for the treatment group ($35,858 − $23,157 = $12,701) and the change in earnings for the control group ($25,716 − $22,404 = $3,312), which comes to $9,389 (Table 4.1).

Gross and Net Effects by Rank and Component

Table 4.2 reports gross and net effects for the 27 rank × component groups listed in Table 3.3 for reservists serving 0–30 active-duty days in 2000 and more than 30 active-duty days in 2002 or 2003. Not surprisingly, given quadratic age-earnings profiles (see Mincer, 1974, or Murphy and Welch, 1990), we observe substantial earnings gains among the control groups for junior enlisted and junior officers. Gains among the control groups for senior enlisted and senior officers are smaller; in fact, these gains are often negative (perhaps partly because of business cycle effects); 2000 was a yearly business cycle peak, 2002 and 2003 were nearly business cycle troughs.

[1] Appendix C presents a "difference-in-differences" model (see Meyer, 1995) that exactly justifies this approach. See also the additional discussion and results in the next chapter. This difference-in-differences approach implicitly assumes that any unobservable differences between the control and treatment group are uncorrelated with growth rates in earnings.

Table 4.2
Gross and Net Effects, by Rank and Component

		Gross Effect		Net Effect	
Rank	Component	Treatment ($)	Control ($)	Level ($)	% Change
E1–E4	Army National Guard	12,701	3,312	9,389	41
E1–E4	Army Reserve	15,923	3,832	12,091	55
E1–E4	Air National Guard	13,238	6,112	7,125	30
E1–E4	Air Force Reserve	11,201	4,493	6,708	24
E1–E4	Marine Reserve	19,155	6,489	12,666	64
E1–E4	Naval Reserve	11,790	3,488	8,302	27
E5–E9	Army National Guard	12,959	–691	13,650	34
E5–E9	Army Reserve	15,955	572	15,383	36
E5–E9	Air National Guard	9,936	–864	10,800	21
E5–E9	Air Force Reserve	10,338	306	10,033	20
E5–E9	Marine Reserve	20,450	3,868	16,582	37
E5–E9	Naval Reserve	12,586	2,174	10,412	24
W1–W5	Army National Guard	19,794	–2,334	22,128	33
W1–W5	Army Reserve	24,426	–3,811	28,237	43
W1–W5	Naval Reserve	8,662	3,357	5,305	8
O1–O3	Army National Guard	11,912	–1,561	13,473	19
O1–O3	Army Reserve	25,898	8,242	17,656	31
O1–O3	Air National Guard	30,392	5,009	25,383	41
O1–O3	Air Force Reserve	26,576	9,562	17,015	24
O1–O3	Marine Reserve	31,585	9,282	22,302	32
O1–O3	Naval Reserve	42,070	15,274	26,796	43
O4–O6	Army National Guard	27,550	15,375	12,175	18
O4–O6	Army Reserve	24,334	–275	24,608	30
O4–O6	Air National Guard	31,335	–1,339	32,674	38
O4–O6	Air Force Reserve	21,412	–170	21,582	21
O4–O6	Marine Reserve	20,510	1,391	19,119	20
O4–O6	Naval Reserve	38,283	3,615	34,668	40
		28,087	6,103	21,983	24

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and more than 30 days in 2002 or 2003.

Some of the patterns are similar for gross effects (Table 3.3) and for net effects (Table 4.2). Specifically, as with gross effects, net effects are larger for higher-ranking reservists. However, control effects are also larger for junior-ranking reservists, so that the percentage changes are smaller for senior-ranking reservists.

Note also that the pattern by component shifts. While gross effects were clearly largest for the Marine Reserve, net effects for the Marine Reserve are not much larger than for other services and they are often not the largest. Instead, net effects are usually largest for the Army Reserve.

Gross and Net Effects by Active-Duty Days and Out Year

Table 4.3 presents net effects by active-duty days and out year. Within rank and component groups, the absolute difference between the gross and net effect is constant across active-duty days. Thus, the proportional difference between gross and net effects falls as active-duty days increase. For example, for reservists serving 31–90 active-duty days in 2003, the estimated net effect of activation on earnings is 28 percent (= ($6,548 – $4,734)/$6,548), smaller than the gross effect. The net adjustment is smaller (about 11 percent; = ($22,177 – $19,843)/$22,177) for reservists serving 271+ days on active duty in 2003.

As in Chapter 3, Table 4.3 reweights these net effect estimates to account for changes in the distribution of rank and component between

Table 4.3
Gross and Net Effects, by Out Year Change and Active-Duty Days Change

	2002		2003	
	Gross ($)	Net ($)	Gross ($)	Net ($)
0–30	2,317	0	2,228	0
31–90	5,247	2,984	6,548	4,734
91–180	8,593	6,423	10,636	8,431
181–270	12,845	10,701	16,116	13,808
271+	19,327	16,877	24,721	22,673
31+	**10,465**	**8,197**	**15,647**	**13,592**

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000. The net effect is the weighted average of net effects computed within rank and component groups. Rank is as of the base year (2000). Change = (Gross – Net)/Gross.

Table 4.4
Reweighted Net Effects, by Out Year and Active-Duty Days

Active-Duty Days	2002 ($)	2003 ($)
31–90	2,601	4,344
91–180	6,433	8,473
181–270	11,496	14,068
271+	16,877	23,049
31+	**9,999**	**13,592**

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000. The net effect is the weighted average of net effects computed within rank and component groups. This mean net effect is then reweighted according to the overall distribution of reservists by rank and component serving more than 30 days of active-duty service in 2003.

reservists serving on active duty in 2002 and 2003. This reweighting, which holds the distribution of reservists by rank and component constant at 2003 values, shows that net effects increase between 2002 and 2003 for reasons other than changes in the distribution of reservists by rank, component, and days activated (Table 4.4). We suggested in Chapter 3 that the estimated increase in gross effects between 2002 and 2003 is most likely the result of increases in the receipt of special pays, allowances, and CZTE, as well as increases in basic pay from changes in the military pay table (Table 3.8). This likely explains the increase in net effects between 2002 and 2003 as well.

Summary

This chapter has presented estimates of the net effect of activation on earnings. These estimates indicate that reservists activated 0–30 days in 2000 and more than 30 days in 2002 or 2003 experienced a net earnings gain of $9,389 over what they would have earned had they not been activated. This estimated net effect is smaller than the gross effect reported in Chapter 3. The fact that earnings tend to grow over time regardless of activation status accounts for the difference between

the estimated net and gross effects. Nevertheless, the basic pattern of substantial average gains is still found in all tabulations.

Thus far, we have presented the estimated impact of activation on mean earnings. In the next chapter, we consider how activation impacts the probability of experiencing an earnings loss.

CHAPTER FIVE

Gross and Net Effects on Earnings Loss

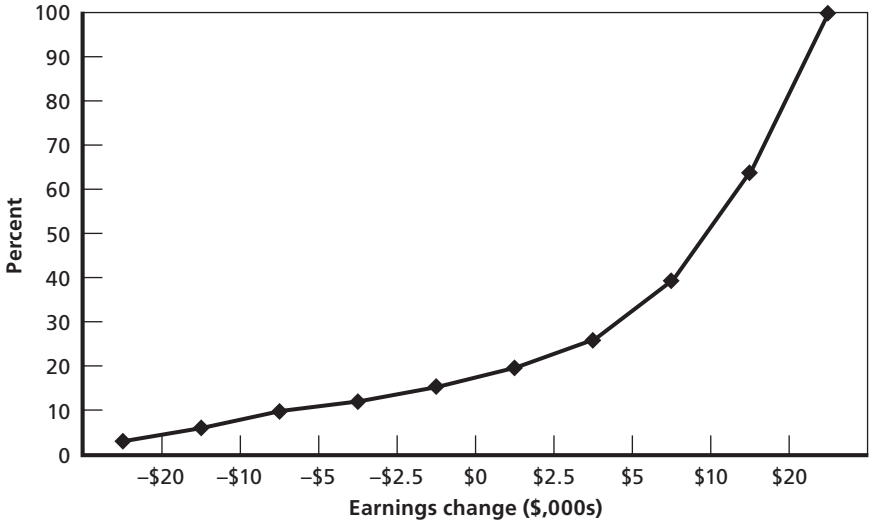
The previous two chapters have analyzed the gross and net effect of activation on mean earnings. Much of the policy discussion, however, has focused on reservists experiencing an earnings loss. The substantial mean earnings gains reported in the previous two chapters could obscure the prevalence of earnings loss. In the extreme, substantial earnings gains could result from a few reservists with very substantial earnings gains, while the vast majority of reservists experience earnings losses. In this chapter, we analyze the prevalence of earnings loss, directly employing both the gross and net measures described in previous chapters.

Gross Losses by Out Year and Active-Duty Days

In Figure 5.1, we plot the cumulative distribution of absolute earnings changes and, in Figure 5.2, we graph the distribution of percentage earnings changes (i.e., the percent change in earnings relative to base-year earnings). For reservists activated 0–30 days in 2000 and more than 30 days in 2002 and 2003, Figure 5.1 indicates that 17 percent of reservists experience an earnings loss when activated. For 6 percent of these reservists, the earnings loss is more than $10,000, and for 11 percent, the earnings loss is more than 10 percent of base-year earnings (Figure 5.2).

The percentage of reservists experiencing an earnings loss differs little between 2002 and 2003 (Table 5.1). Overall, the percentage of reservists with an earnings loss decreases from 19 to 15 percent between 2002 and 2003. In the 271+ group, the percentage with an earnings

Figure 5.1
The Cumulative Distribution of Absolute Earnings Changes



NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and more than 30 days in 2002 or 2003.

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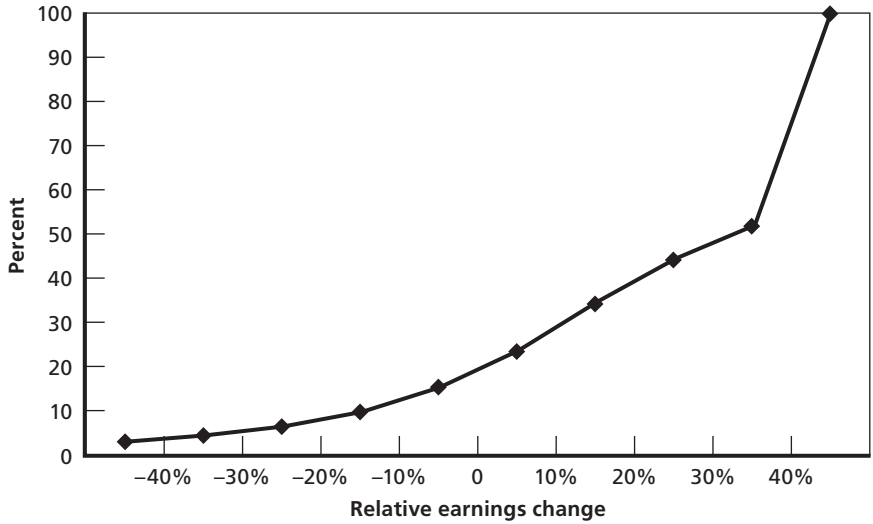
Figure 5.2
The Cumulative Distribution of Percentage Earnings Changes



NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and more than 30 days in 2002 or 2003.

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loss decreases more markedly, from 13 to 7 percent. Reweighting by rank and component has some effect but does not eliminate all differences (Table 5.2).

Table 5.1
Percentage of Reservists Experiencing Any Earnings Loss, Loss Greater than $10,000, or Loss Greater than 10 Percent of Base-Year Earnings, by Out Year and Active-Duty Days

Active-Duty Days	2002			2003		
	% Any	% >$10k	% >10%	% Any	% >$10k	% >10%
0–30	39	12	26	41	16	30
31–90	24	9	16	25	10	17
91–180	20	7	12	19	8	13
181–270	16	5	9	13	5	8
271+	13	5	7	7	2	4
31+	**19**	**7**	**12**	**15**	**6**	**10**

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000.

Table 5.2
Reweighted Percentage of Reservists Experiencing Any Earnings Loss, Loss Greater than $10,000, or Loss Greater than 10 Percent of Base-Year Earnings, by Out Year and Active-Duty Days

Active-Duty Days	2002			2003		
	% Any	% >$10k	% >10%	% Any	% >$10k	% >10%
0–30	39	13	26	41	16	30
31–90	25	9	16	25	10	17
91–180	20	8	13	19	8	13
181–270	15	5	9	13	5	8
271+	12	4	7	7	3	4
31+	**17**	**6**	**11**	**15**	**6**	**10**

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000. All figures are weighted according to the overall distribution of reservists by rank and component serving more than 30 days of active-duty service in 2003.

Gross Losses By Reservist Characteristics

In this section we examine gross losses by rank, component, self-employed status, and base-year earnings.

Rank and Component

Table 5.3 presents the percentage of reservists who served 0–30 days on active duty in 2000 and more than 30 days on active duty in 2002

Table 5.3
Percentage of Reservists Experiencing Any Earnings Loss, Loss Greater than $10,000, or Loss Greater than 10 Percent of Base-Year Earnings, by Rank and Component

Rank	Component	% Any	% >$10k	% >10%
E1–E4	Army National Guard	15	4	10
E1–E4	Army Reserve	11	3	8
E1–E4	Air National Guard	15	5	10
E1–E4	Air Force Reserve	18	6	13
E1–E4	Marine Reserve	8	3	5
E1–E4	Naval Reserve	20	8	14
E5–E9	Army National Guard	16	6	10
E5–E9	Army Reserve	14	6	9
E5–E9	Air National Guard	19	9	12
E5–E9	Air Force Reserve	19	8	11
E5–E9	Marine Reserve	14	7	9
E5–E9	Naval Reserve	21	9	13
W1–W5	Army National Guard	13	8	9
W1–W5	Army Reserve	11	6	7
W1–W5	Naval Reserve	18	17	17
O1–O3	Army National Guard	12	6	8
O1–O3	Army Reserve	11	6	7
O1–O3	Air National Guard	13	9	9
O1–O3	Air Force Reserve	12	8	8
O1–O3	Marine Reserve	8	5	6
O1–O3	Naval Reserve	13	7	8
O4–O6	Army National Guard	14	10	10
O4–O6	Army Reserve	13	9	9
O4–O6	Air National Guard	18	14	13
O4–O6	Air Force Reserve	18	12	12
O4–O6	Marine Reserve	11	7	6
O4–O6	Naval Reserve	17	12	12

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and more than 30 days in 2002 or 2003.

or 2003 with any loss or a large loss (greater than $10,000 or 10 percent of base-year earnings) by rank and component. The table indicates that in no group do more than 21 percent of reservists have any losses and in no group do more than 17 percent of reservists experience a loss of more than 10 percent. The only strong pattern in these results by rank and component is that the fraction experiencing a loss of more than $10,000 tends to increase with rank (as would be expected with a common distribution of percentage changes in earnings).

The Self-Employed and Dropping Those Apparently Out of the Labor Force

Table 5.4 reports the percentage of reservists with any loss and the percentage with a large loss for the self-employed and the group of reservists with earnings of more than $5,000 in 2000 by active-duty days of service and out year (i.e., dropping those "apparently out of the labor force"). The results show that the self-employed are considerably more likely than non–self-employed to experience an earnings loss (24 versus 15 percent), an earnings loss of more than $10,000 (15 versus 6 percent), or an earnings loss of more than 10 percent (20 versus 9 percent). As expected, earnings losses are somewhat more prevalent among

Table 5.4
Percentage of Reservists Experiencing Any Earnings Loss, Loss Greater than $10,000, or Loss Greater than 10 Percent of Base-Year Earnings, by Out Year and Active-Duty Days: Self-Employed, Earnings >$5k

Active-Duty Days	Self-Employed			Not Self-Employed			>$5K		
	Earnings Loss			Earnings Loss			Earnings Loss		
	% Any	% >$10K	% >10%	% Any	% >$10K	% >10%	% Any	% >$10K	% >10%
0–30	62	31	55	40	15	29	42	19	30
31–90	34	21	28	24	10	16	27	12	18
91–180	27	17	23	19	8	13	22	9	15
181–270	20	12	16	13	5	8	15	6	9
271+	9	5	6	7	2	4	8	3	4
31+	**24**	**15**	**20**	**15**	**6**	**9**	**17**	**7**	**11**

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and more than 30 days in 2002 or 2003.

the group of reservists with earnings of more than $5,000 in 2000 and 2003 (compared to all reservists, e.g., Table 5.1).

The Net Loss Concept

We begin by defining a net loss concept in parallel fashion to the net effects in Chapter 4, that is, the difference between the likelihood an activated reservist experiences an earnings loss between the base and out year and the likelihood that this reservist would have experienced an earnings loss had the reservist not been activated. Computationally, we estimate this net loss as the difference between the fraction of activated reservists experiencing an earnings loss and the fraction of otherwise similar (i.e., same rank and component) unactivated reservists experiencing an earnings loss.

We provide an example of such a computation in Table 5.5 for junior enlisted members of the Army National Guard serving more than 30 days on active duty in 2003. The first row of Table 5.5 reports the percentage of reservists serving 0–30 days in 2000 and 31+ days in 2003 experiencing any loss (15 percent).

The second row reports the percentage of reservists serving only 0–30 days in both 2000 and 2003 with any loss. Note that 40 percent of these nonactivated reservists experienced a decline in earnings between 2000 and 2003.

This is a large fraction that experience losses. This result, which we will see holds across activated reservists in general, is consistent with the conventional academic characterization of the civilian labor market as very dynamic (MaCurdy, 1982). To understand this finding, consider the case where there is no wage growth on average, but that there is variation around the mean from year-to-year. For example, in one year, a worker gets slightly more overtime (a better job, has more unemployment, gets a bonus); in the next year, he does not. In that case, half of all workers would have losses.

In fact, there is some average wage growth. Thus, we would expect more than half of the population to have gains; and, that is what we find. However, the year-to-year fluctuation postulated in the previous

Table 5.5
Computing Net Losses for Junior Enlisted Members of the Army National Guard

	Active-Duty Days				
	2000	2003	% Any Loss	% >10k	% >10%
Treatment	0–30	31+	15	4	10
Control	0–30	0–30	40	13	32
Net	0–30	31+	–25	–9	–22

NOTE: Sample restricted to junior enlisted members of the Army National Guard.

paragraph (e.g., a different job, overtime, bonuses, unemployment) are sufficiently negative that for many individuals they outweigh average wage growth. Thus, well over a third of reservists have losses. Losses are likely to be particularly common over the pairs of years considered here (i.e., 2000 versus 2002 and 2000 versus 2003) because 2000 was nearly the peak of the business cycle expansion of the Clinton years, while 2002 and 2003 were nearly the trough of the recession during the first Bush term.

Following the same approach as in Chapter 4, we use these reservists as our control group and so the net effect of activation is the difference between the percentage with an earnings loss in our activated (treatment) group and the percentage with an earnings loss in our non-activated (control) group: 15% – 40% = –25%.

Thus, the net effect of activation is to *reduce* the probability a junior enlisted member of the Army National Guard experiences an earnings loss by 25 percentage points.

We now turn to similar computations for all reservists (Table 5.6). In our sample of all reservists serving 0–30 active-duty days in 2000 and in 2003, nearly half (40 percent) of those serving 0–30 active-duty days in either 2002 or 2003 experienced an earnings loss, 14 percent experienced an earnings loss of more than $10,000, and 28 percent experienced an earnings loss of more than 10 percent of their base year earnings. In contrast, reservists activated (for more than 30 days) have an earnings loss (17 percent any loss, 6 percent a loss of more than $10,000, 11 percent a loss of more than 10 percent). The net result of relatively few activated reservists experiencing earnings losses, but

Table 5.6
Computing Net Losses for All Reservists

	Active-Duty Days				
	2000	2002/2003	% Any Loss	% >10k	% >10%
Treatment	0–30	31+	17	6	11
Control	0–30	0–30	40	14	28
Net	0–30	31+	–23	–8	–17

large numbers of unactivated reservists experiencing earnings losses, is a large drop in the probability a reservist experiences an earnings loss when activated compared to his probability of experiencing an earnings loss in the civilian labor market.

Net Loss by Reservist Characteristics

In Table 5.7, we report net losses by rank and component, self-employment status, and base-year earnings (>$5,000). Net losses are uniformly negative, suggesting that no matter what the group, reservists are less likely to experience an earnings loss when serving on active duty than when not serving on active duty. There is no obvious pattern in net losses by rank and component. The self-employed have lower net losses than the non–self-employed and net losses are somewhat less negative for those earnings more than $5,000 in 2000.

Net Loss by Out Year and Active-Duty Days

Table 5.8 presents net losses by out year and active-duty days. Net losses decline as active-duty days served increase, implying that the probability of experiencing a loss declines as active-duty days served increase. Net losses are also smaller (i.e., more negative) in 2003 than in 2002. Reweighting by rank and component has some effect but does not eliminate all differences in net losses between 2002 and 2003 (Table 5.9).

Table 5.7
Net Loss, by Rank and Component, Self-Employment Status, and Base-Year Earnings

Rank	Component	% Any	% >$10k	% >10%
E1–E4	Army National Guard	–25	–9	–22
E1–E4	Army Reserve	–27	–9	–24
E1–E4	Air National Guard	–17	–7	–15
E1–E4	Air Force Reserve	–18	–8	–16
E1–E4	Marine Reserve	–26	–10	–23
E1–E4	Naval Reserve	–20	–8	–17
E5–E9	Army National Guard	–31	–12	–23
E5–E9	Army Reserve	–30	–12	–22
E5–E9	Air National Guard	–23	–10	–16
E5–E9	Air Force Reserve	–21	–8	–14
E5–E9	Marine Reserve	–25	–11	–19
E5–E9	Naval Reserve	–19	–6	–13
W1–W5	Army National Guard	–30	–17	–23
W1–W5	Army Reserve	–37	–18	–26
W1–W5	Marine Reserve	–10	–12	–14
W1–W5	Naval Reserve	–27	1	–6
O1–O3	Army National Guard	–21	–10	–15
O1–O3	Army Reserve	–26	–13	–18
O1–O3	Air National Guard	–16	–8	–11
O1–O3	Air Force Reserve	–17	–8	–13
O1–O3	Marine Reserve	–20	–13	–18
O1–O3	Naval Reserve	–14	–7	–10
O4–O6	Army National Guard	–30	–17	–21
O4–O6	Army Reserve	–32	–16	–23
O4–O6	Air National Guard	–23	–13	–16
O4–O6	Air Force Reserve	–21	–11	–15
O4–O6	Marine Reserve	–31	–19	–24
O4–O6	Naval Reserve	–20	–10	–13
Self-Employed[a]		–37	–16	–34
Not Self-Employed[a]		–47	–26	–45
>$5K[a]		–25	–12	–19

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and more than 30 days in 2002 or 2003.

[a] The net loss for these groups is the weighted average of net losses computed within rank and component groups.

Table 5.8
Net Loss, by Out Year and Active-Duty Days

Active-Duty Days	2002			2003		
	% Any	% >$10k	% >10%	% Any	% >$10k	% >10%
31–90	–15	–4	–9	–17	–7	–13
91–180	–19	–5	–13	–21	–8	–17
181–270	–23	–7	–16	–27	–11	–22
271+	–25	–8	–18	–35	–14	–27
31+	**–19**	**–6**	**–13**	**–26**	**–10**	**–20**

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000. The net loss is the weighted average of net losses computed within rank and component groups.

Table 5.9
Reweighted Net Loss, by Out Year and Active-Duty Days

Active-Duty Days	2002			2003		
	% Any	% >$10k	% >10%	% Any	% >$10k	% >10%
31–90	–14	–3	–9	–16	–6	–13
91–180	–19	–5	–13	–22	–8	–17
181–270	–24	–7	–17	–28	–11	–22
271+	–26	–8	–19	–34	–14	–26
31+	**–21**	**–6**	**–15**	**–26**	**–10**	**–20**

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000. The net loss is the weighted average of net losses computed within rank and component groups. This mean net loss is then reweighted according to the overall distribution of reservists by rank and component serving more than 30 days of active-duty service in 2003.

Net Losses by Active-Duty Days Served in the Base Year

Thus far, we have presented results only for reservists who served 0–30 active-duty days in 2000. In this section, we show that our estimates of net losses are unaffected by this sample restriction. Table 5.10 reports the fraction of reservists with any loss (i.e., the gross loss) between 2000 and 2002/2003 by active-duty days served in 2000 and 2002/2003. The first row of the table reports the gross losses for reservists serving 0–30 active-duty days in 2000. As we have already noted, gross losses

Table 5.10
Gross Loss, by Base-Year and Out Year Active-Duty Days

Base-Year Active-Duty Days: 2000	Out Year Active-Duty Days: 2002/2003				
	0–30	31–90	91–180	181–270	271+
0–30	41%	25%	19%	13%	7%
31–90	42%	21%	15%	10%	5%
91–180	41%	29%	15%	5%	2%
181–270	50%	40%	32%	12%	3%
271+	72%	58%	57%	40%	7%

decrease with days of active-duty service in 2002/2003. The second row of the table reports gross losses for reservists serving 31–90 days in 2000. Here again, we see that gross losses decline with active-duty days served in 2000. Indeed, this pattern holds for each active-duty-day group in the base year (i.e., in each row of Table 5.10). Thus, earnings losses are always the most common among reservists who served the same or fewer days on active duty in 2002/2003 as they did in 2000.

In Table 5.11, we compute net losses, where the control group for each row is the group of reservists serving 0–30 active-duty days in 2002/2003. (Again, net losses are computed within rank and component groups.) Net losses decrease (i.e., become more negative) with

Table 5.11
Net Loss, by Base-Year and Out Year Active-Duty Days

Base-Year Active-Duty Days: 2000	Out Year Active-Duty Days: 2002/2003				
	0–30	31–90	91–180	181–270	271+
0–30	0%	–17%	–21%	–27%	–35%
31–90	2%	–20%	–25%	–29%	–35%
91–180	2%	–10%	–23%	–33%	–37%
181–270	11%	2%	–7%	–26%	–36%
271+	33%	19%	18%	1%	–33%

NOTE: The net loss is the weighted average of net losses computed within rank and component groups. For each row, the control group is the group serving 0–30 active-duty days in 2002/2003.

days served on active duty in the out year for all groups of reservists. There is no obvious pattern in net effects by active-duty days served in the base year.

Summary

This chapter has shown that some reservists (about 17 percent in our sample) do experience a gross earnings loss when activated. However, an even larger percentage of reservists experience an earnings loss between any two years when they remain unactivated. On net, then, the probability a given reservist experiences an earnings loss declines substantially (23 percentage points) when that reservist is called to active duty.

This does not mean that no reservist in our sample suffered a loss of earnings as a result of being activated. The likelihood of suffering an earnings loss between any two years declines as active-duty days served increase, but some activated reservists nonetheless did suffer an earnings loss as a result of their activation. However, how many reservists suffered an earnings loss as a result of activation is unknown since we cannot know for certain what any given reservist would have earned had he not been activated.[1] As discussed in the conclusion, this is a problem for determining the causal impact of activation on earnings loss, which in turn has implications for the overall fairness of earnings replacement legislation.

[1] See Appendix E for one approach to answering this counterfactual question.

CHAPTER SIX

Preliminary Results for 2004

The results of the previous chapters suggest that reservists activated in 2003 experienced larger gains on average and were less likely to experience earnings losses than those activated in 2002. Utilization of the reserves continues to evolve during the GWOT, as does reserve compensation. It is, therefore, of interest to determine whether the results on earnings gains and losses in 2002 and 2003 are likely to continue to hold in later years.

Unfortunately, as of our analysis, completed SSA earnings data are only available through 2003. Final SSA earnings data are available with a lag of about 14 months (e.g., for calendar year 2004 in February 2006). In contrast, final DMDC military pay data are available almost immediately. Since our main method requires both SSA and DMDC data (and allowing time for SSA to pull new analysis files for us to do the analysis), annual results are only available with a lag of about a year and a half. However, since total earnings in years of activation are primarily military earnings, we can approximate out-year earnings using current DMDC military pay data. This is the approach we used in our earlier report on this topic (Klerman, Loughran, and Martin, 2005). In this chapter, we apply similar methods to generate estimates of earnings changes through 2004. As we explain below, using this method, we can compute neither net effects nor net losses.

We begin with a description of the Klerman, Loughran, and Martin (2005) methodology and the modifications we make to it for this report. We then present results using this alternative methodology

and compare those results to the results presented earlier in this report. Finally, we present results disaggregated by reservist characteristics and discuss how the results change between 2003 and 2004.

Methods

The method we employ in our primary analysis, presented in earlier chapters, exploits the availability of total earnings (civilian and military earnings and an imputed value of the tax advantage) in every year. For 2004, we have data on military earnings, but we do not have any data on civilian earnings. Consequently, we cannot implement the approach used in Chapters 3 through 5 to compute gross and net effects and losses for reservists serving on active duty in 2004.

The alternative methodology of this chapter compares annual unactivated earnings with annual activated earnings. Appendix F of this document and our earlier paper (Klerman, Loughran, and Martin, 2005) provide more details and a careful discussion of the issues involved in using this alternative methodology. In brief, we begin with reservists who served 0–30 days on active-duty days in 2000. For those reservists, we approximate annual earnings when not activated as total SSA earnings minus any active-duty military pay. We then annualize those civilian earnings according to the number of days the reservist was not serving on active duty (i.e., we multiply earnings by 360/(360 – active-duty days)).

We compute earnings when activated as all military earnings received while serving on active duty (active duty regular and special pays plus allowances minus pay received for IDT). We annualize this earnings figure in the same manner as above (i.e., we multiply military earnings by 360/(active-duty days)). We then compute the tax advan-

tage accorded those military earnings based on the assumption that earnings received during months not activated are the same as civilian earnings received in the base year.[1]

This method for estimating 2004 gross effects and losses is inferior to that employed in Chapters 3 through 5 in a number of important ways. First, this method annualizes civilian and military earnings in a simple linear fashion that is unlikely to be exactly correct and that likely causes us to significantly mismeasure both civilian and military earnings. Because the extrapolation is to a full year on active duty, we expect it to produce more reliable estimates of out-year earnings for those reservists activated more than 271 days.

Second, for computing the tax advantage, we assume civilian earnings in the base year are a good proxy for (real) civilian earnings in the out years. Third, this method assumes that reservists do not receive any civilian pay while serving on active duty. Some employers continue to pay their reserve employees when they serve on active duty.

Finally, and perhaps most significantly, this method does not allow us to compute net effects and losses, which, as we showed in Chapters 4 and 5, produce very different estimates of earnings loss than the gross effects and losses reported in Chapter 3. Without data on 2004 earnings, we do not know how civilian earnings changed between the base year and 2004 for reservists who did not serve on active duty in 2004.

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[1] For a number of reasons, the results we present here are not directly comparable to those reported in Klerman, Loughran, and Martin (2005). First, our earlier paper relied on a preexisting sample of Air Force and Army reservists activated for the GWOT in 2001 and 2002. Here, our sample includes all reservists serving 0–30 days on active duty in 2000 and more than 30 days on active duty in 2002 and 2003. Second, we compute civilian earnings by subtracting military earnings as estimated from the RPF and ADPF from total SSA earnings. Our earlier paper relied on an estimate of civilian earnings generated by SSA. Third, the computation here uses an improved tax program. The current program correctly subjects earnings in a combat zone to social security taxes. (The program used in the earlier paper did not; neither program subjects those earnings to income taxes.) In addition, the improved program corrects an error in the "Green Book" computation of the value of the tax advantage for those in the highest tax bracket (i.e., the "open" bracket). Finally, in this analysis, we employ a base year of 2000 rather than 2001.

The Trend in Gross Effects

Despite these limitations with the alternative method, it is of considerable policy interest to understand whether our estimates of earnings loss in 2002 and 2003 are likely to continue in 2004. This is especially true because our estimates of average earnings gains were larger and our estimates of earnings losses were smaller for reservists activated in 2003 compared to reservists activated in 2002. Our primary concern here, then, is not so much with the level of earnings loss or gain in 2004, but instead with how the level of earnings loss or gain changes between 2003 and 2004.

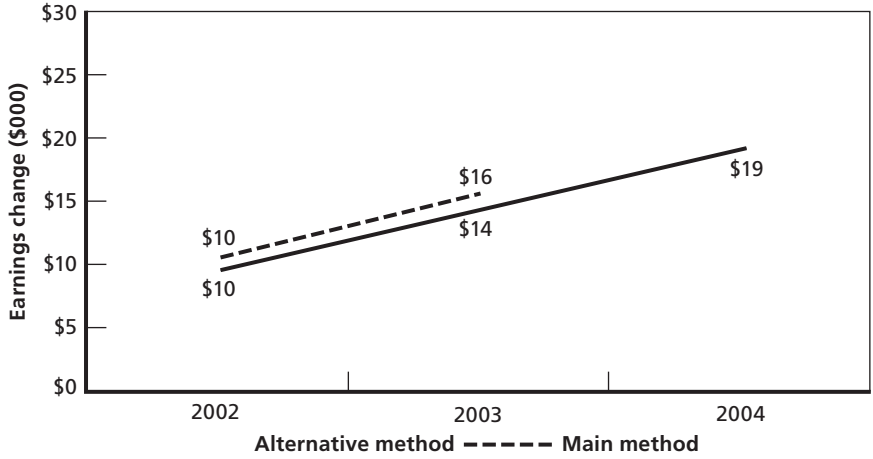
In Table 6.1, we present (unreweighted) estimates of gross effects using our primary and alternate methods by days of active-duty service

Table 6.1
Gross Effects Employing Primary and Alternate Methods, by Out Year and Active-Duty Days

Out Year	Base-Year Earnings ($)		Out-Year Earnings ($)		Gross Effect ($)	
	Primary	Alt.	Primary	Alt.	Primary	Alt.
			31–90			
2002	46,240	47,991	51,487	54,293	5,247	6,302
2003	45,237	45,655	51,785	53,405	6,548	7,750
2004		46,556		58,137		11,581
			91–180			
2002	39,444	40,756	48,036	52,367	8,593	11,610
2003	42,387	42,755	53,024	55,426	10,636	12,671
2004		40,273		60,925		20,652
			181–270			
2002	41,360	42,278	54,204	54,197	12,845	11,919
2003	40,486	41,318	56,602	57,577	16,116	16,259
2004		39,292		60,856		21,564
			271+			
2002	43,628	45,007	62,955	57,046	19,327	12,039
2003	38,510	39,799	63,232	58,872	24,721	19,073
2004		39,246		62,864		23,618
			31+			
2002	**43,416**	**44,888**	**53,880**	**54,479**	**10,465**	**9,592**
2003	**41,426**	**42,194**	**57,073**	**56,545**	**15,647**	**14,351**
2004		**41,611**		**60,687**		**19,076**

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000.

Figure 6.1
Gross Effects by Estimation Method and Out Year



NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and 31+ days in the out years.

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in the out year. As expected, the primary and alternative methods show roughly similar increases in gross effects across out years. Indeed, in the sample as a whole, the gross effects estimated by both methods are very close (i.e., for 31+ days in 2003, the second to last row).

This similarity of estimated gross effects for the primary and alternative methods suggests that the alternative method is a useful predictor of future estimates using the (preferred) primary method. The results are striking. The alternative method's gross earnings gains for 2004 are much larger than those in 2003 ($19,076 versus $14,351). Much of the difference appears to be longer activations in 2004 compared to 2003 (which we have seen have larger earnings gains). However, even when grouped by days activated (i.e., the other panels of Table 6.1), there are still substantial earnings gains (e.g., for 271+ days activated, $23,618 in 2004 versus $19,073 in 2003).

The primary method implies a gross effect of $15,647, while the alternate method implies a gross effect of $14,351. Other estimates are less similar.

In Table 6.2, we present estimates of gross losses by out year and days of active-duty service employing the primary and alterna-

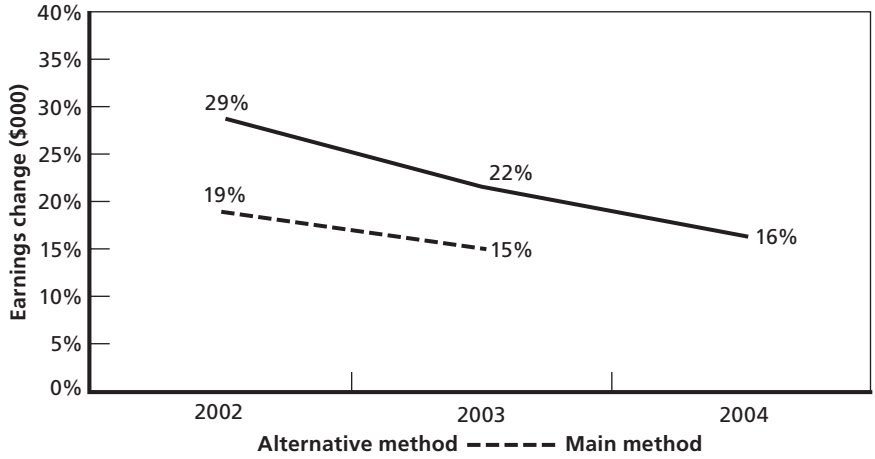
Table 6.2
Gross Losses Employing Primary and Alternate Methods, by Out Year and Active-Duty Days

Active-Duty Days	Out Year					
	2002		2003		2004	
	Primary	Alternate	Primary	Alternate	Primary	Alternate
31–90	24%	36%	25%	33%		28%
91–180	20%	24%	19%	22%		14%
181–270	16%	22%	13%	18%		12%
271+	13%	25%	7%	15%		10%
31+	**19%**	**29%**	**15%**	**22%**		**16%**

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000.

tive methods. Here, the estimates are less similar. Overall, the alternative method produces higher estimates of gross losses than does the primary method. However, both methods show decreasing net losses across out years (as shown in the table and in Figure 6.2). Thus, we should expect gross losses in 2004 as estimated by the primary method to fall from its level in 2003.

Figure 6.2
Gross Losses by Estimation Method and Out Year



NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and 31+ days in the out years.

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Accounting for Differences Across Out Years

As in Chapters 3 through 5, we can reweight the estimated gross effects to account for changes in the distribution of rank and component of reservists activated in different out years.

The second column of Table 6.3 ("Base-Year Earnings") suggests that differences in base-year earnings result from composition, and thus, are nearly eliminated by reweighting (e.g., for 31+, $41,260 in 2002 versus $40,318 in 2004; compare to $44,888 in 2002 and $41,611 in 2004 in Table 6.1). Differences in out-year earnings remain and, in many cases, are larger between 2004 and 2003 than between 2003 and 2002 (e.g., $53,304 in 2002 versus $60,231 in 2004; compare to $54,479 versus $60,687 in Table 6.1).

Table 6.4 shows that, on average, out-year earnings increase between 2002 and 2004 because of increases in military earnings, which in turn, increase largely because of increases in basic pay and the value of the tax advantage.

Table 6.3
Reweighted Gross Effects Employing Alternate Method, by Out Year and Active-Duty Days

Out Year	Base-Year Earnings	Out-Year Earnings	Gross Effect
	31–90		
2002	$41,570	$49,572	$8,002
2003	$42,323	$50,994	$8,671
2004	$41,847	$54,081	$12,234
	91–180		
2002	$40,788	$53,277	$12,489
2003	$42,091	$56,467	$14,375
2004	$40,152	$62,018	$21,866
	181–270		
2002	$41,304	$54,748	$13,444
2003	$40,764	$58,261	$17,497
2004	$40,142	$60,553	$20,410
	271+		
2002	$40,432	$54,967	$14,535
2003	$39,206	$59,946	$20,740
2004	$38,718	$64,125	$25,407
	31+		
2002	**$41,269**	**$53,304**	**$12,036**
2003	**$41,077**	**$56,627**	**$15,550**
2004	**$40,318**	**$60,231**	**$19,913**

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000. All figures are weighted according to the overall distribution of reservists by rank and component serving more than 30 days of active-duty service in 2003.

Table 6.4
Reweighted Civilian and Military Earnings by Out Year

	2002 ($)	2003 ($)	2004 ($)
Total	53,304	56,627	60,231
Military	47,221	49,704	52,011
Tax advantage	6,083	6,924	8,221
Detail Military			
Basic pay	34,127	35,822	37,208
Drill pay	0	0	0
BAS	1,920	588	576
BAH	9,155	9,917	10,581
FSA	383	1,279	1,256
HFP	250	705	919
Bonuses	947	844	697
Other pays	440	551	774

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and 31+ days in the out years. All figures are weighted according to the overall distribution of reservists by rank and component serving more than 30 days of active-duty service in 2003.

Summary

This chapter has described and implemented an alternative method that allows us to provide preliminary results on gross effects and losses for reservists serving on active duty in 2004. In summary, we obtain different results using the primary and alternative methods, but the trends in the results across out years are similar enough to suggest that the alternative method produces a reasonably reliable indication of what results using the primary method will look like when 2004 SSA earnings data become available.

The alternative method suggests that reservists activated in 2004 most likely, on average, experienced substantial earnings gains. Results from these analyses using the alternative method suggest that relative to 2003, average earnings gains in 2004 are likely to be slightly larger and earnings losses are likely to be slightly less common. This appears to result from increases in military pays and allowances and more reservists serving overseas where they collect FSA, HFP, and CZTE.

CHAPTER SEVEN

The Effect of Activation on Postactivation Earnings: Early Estimates

To date, the focus of policymakers has been on how activation affects earnings while reservists are serving on active duty. Results presented in earlier chapters address this concern. However, as large numbers of reservists begin to return from extended periods on active duty, the focus of policymakers will likely shift to the effect of activation on postactivation earnings. While the Uniformed Services Employment and Reemployment Rights Act (USERRA) guarantees activated reservists the right to return to their preactivation job (providing it still exists), it is still possible that reservists might lose their jobs or, more subtly, miss out on promotions and other opportunities to increase their civilian earnings during their period of activation.

In this chapter, we present some early estimates of the effect of activation on postactivation earnings based on a sample of reservists activated for a relatively small number of days in 2000 and 2003, but a relatively large number of days in 2001 and 2002.

Sample of Reservists Returning From Active Duty

Our ability to analyze the effect of activation on postactivation earnings is limited by the fact that our civilian earnings data ends in 2003. As Table 7.1 makes clear, few reservists who have been activated for extended periods during the GWOT had returned to civilian life by 2003. For example, we have only 13,605 reservists in our data who served 0–30 days on active duty in 2000, 271+ days over both 2001

Table 7.1
Number of Returned Reservists

Active-Duty Days			Number of Reservists
2000	2001–2002	2003	
0-30	0–30	0–30	245,728
0-30	31–90	0–30	88,334
0-30	91–180	0–30	11,996
0-30	181–270	0–30	8,456
0-30	**271-360**	**0–30**	**6,541**
0-30	**over 360**	**0–30**	**7,064**

and 2002 (not either 2001 or 2002), and then 0–30 days in 2003. With relatively small sample sizes, we cannot reliably disaggregate by reservist characteristics, and we are concerned about how informative their experiences are for later returning reservists.

Still, this sample of reservists returning to civilian life in 2003 allows us to generate early estimates of how activation affects postactivation earnings. However, because of the relatively small and select sample of reservists on which they are based, the results we report below should be viewed with some caution. Most reservists who have served on active duty for extended periods during the GWOT served during the Iraq War in 2003 and later. Long tours of active duty for reservists were relatively uncommon in 2001 and 2002, when military operations were focused on homeland security and operations in Afghanistan. For example, fewer than one percent of reservists serving 0–30 days on active duty in 2000 served more than 270 days on active duty in 2000; 5 and 11 percent of these reservists served more than 270 days on active duty in 2002 and 2003, respectively.

Gross and Net Effects of Activation on Postactivation Earnings

We compute gross and net effects and losses for reservists activated 0–30 days in 2000 and 2003. The gross effect is defined as the differ-

Table 7.2
Gross Effects and Losses Following Activation

Active-Duty Days			Earnings Loss		
2000 and 2003	2001–2002	Earnings Change from 2000 to 2003 ($)	% Any	% >$10k	% >10%
0–30	0–30	1,755	44	18	33
0–30	31–90	3,073	34	13	23
0–30	91–180	3,513	33	13	25
0–30	181–270	3,121	36	14	26
0–30	271–360	2,969	37	14	25
0–30	over 360	2,676	37	14	25

ence between 2000 and 2003 earnings. In Table 7.2, we report this gross effect by active-duty days served in 2001 and 2002 combined.[1]

The gross effects and losses reported in Table 7.2 suggest that, on average, reservists experience an increase in earnings following periods of activation. However, the fraction of reservists with some earnings loss following activation is considerable. There is no readily discernible pattern in gross effects and losses by active-duty days served in 2001 and 2002. Gross effects are somewhat larger and gross losses are somewhat smaller for reservists serving 31–90 days on active duty in 2000 and 2003 compared to reservists serving 0–30 days on active duty in 2000 and 2003.

As we found in Chapters 4 and 5, the net effects and losses suggest a different interpretation of the effect of activation on postactivation earnings. Looking at the first row of Table 7.2, we see that 44 percent of reservists who served only 0–30 days on active duty in 2001/2002 experienced an earnings loss between 2000 and 2003. Thus, just as we saw in Chapter 5, reservists who saw only minimal levels of active-duty service (0–30 days) were *more likely* to experience an earnings loss than those who spent considerable time (31+ days on active duty).

[1] Note that we group combined active-duty days for 2001 and 2002 (0–30, 31–90, 91–180, 181–270, 271–360, 361+) differently than for in earlier chapters, when the groups were for a single calendar year.

Table 7.3 reports net effects as computed in Chapters 4 and 5: taking the difference between the earnings loss of activated and nonactivated (i.e., served 0–30 days total in 2001 and 2002) reservists within rank and component groups.[2] The table shows that by these estimates, reservists returning to their civilian jobs after being activated in 2001 and 2002 were somewhat less likely to experience a decline in earnings between 2000 and 2003 than those reservists who did not serve on active duty. On average, their earnings increased slightly relative to the nonactivated reservists. Note that the estimate of net losses does not change appreciably with active-duty days of service, which suggests that reservists return to their civilian jobs having lost little income relative to those who were not activated, regardless of how many days they were away from their civilian job.

Table 7.4 shows estimates reweighted by rank and component. The reweighting has little effect on the estimates of net effects and losses.

Table 7.3
Net Effects and Losses Following Activation

Active-Duty Days		Net Earnings Change ($)	Net Earnings Loss		
2000 and 2003	2001–2002		% Any	% >$10k	% >10%
0–30	31–90	2,438	–12	7	–11
0–30	91–180	2,101	–11	6	–9
0–30	181–270	1,602	–8	4	–7
0–30	271–360	1,878	–7	5	–8
0–30	over 360	1,692	–7	5	–8

NOTE: The net loss is the weighted average of net losses computed within rank and component groups.

[2] Because of small sample sizes, we cannot compute the alternative net estimates presented in Chapter 5 for these reservists.

Table 7.4
Reweighted Net Effects and Losses Following Activation

Active-Duty Days		Net Earnings Change ($)	Net Earnings Loss		
2000 and 2003	2001–2002		% Any	% >$10k	% >10%
0–30	31–90	2,041	–10	–6	–10
0–30	91–180	1,629	–10	–4	–7
0–30	181–270	1,438	–7	–4	–7
0–30	271–360	1,538	–6	–5	–7
0–30	over 360	1,299	–6	–4	–7

NOTE: The net loss is the weighted average of net losses computed within rank and component groups. This mean net loss is then reweighted according to the overall distribution of reservists by rank and component serving more than 30 days of active-duty service in 2001 and 2002.

Summary

The results reported in this chapter suggest that *for this select sample,* activated reservists do not suffer significant earnings losses following activation. On average, earnings increase between 2000 and 2003 for reservists activated for more than 30 days in 2002 and 2002 and the probability of experiencing an earnings loss declines slightly. We emphasize, however, that these results apply to a select group of reservists and, therefore, should be viewed with some caution. Better estimates of the effect of activation on postactivation earnings will be possible when civilian earnings data for 2004 and 2005 become available.

CHAPTER EIGHT

Conclusion

This report has employed administrative data on the civilian and military earnings of reservists to examine how activation affects the earnings of reservists both during and following activation. We find that reservists on average experience substantial gains in earnings when activated and that the probability of experiencing an earnings loss falls when activated. In this final chapter, we discuss the implications of our findings for reserve compensation policies and outline directions for future analyses.

Divergence from Survey Results

The estimates of earnings loss attributable to activation reported in this study differ markedly from estimates based on survey data, like those generated from the 2004 SOFRC. There are a number of reasons why our estimates might differ. First, a considerable portion of the military earnings of activated reservists is tax-preferred. However, the surveys typically instruct reservists to report pretax earnings. In contrast, our estimates explicitly include an estimate of the value of the tax preference. We estimate that the value of the tax advantage accounts for close to one-third of the mean gain in earnings experienced by activated reservists. Second, the survey responses are categorical and self-reported and, consequently, measure earnings changes with substantial error and perhaps bias. Our estimates are based on administrative data that measure earnings with great precision and without significant bias. Third, the survey questions refer to the most recent activation.

Sometimes, those activations occurred several years earlier. For several reasons, our estimates suggest that earnings losses are less common for more recent activations. Finally, survey and item response rates in the most recent surveys (the SOFRC) are low, which raises the possibility that a selected sample of reservists is responding to these earnings loss questions.

Implications for Policy

Several current congressional proposals would replace lost earnings of reservists who hold civilian jobs in the federal government and provide tax breaks to private-sector employers who do the same for their reserve employees. Also, the 2006 NDAA requires DoD to replace lost earnings of reservists activated for more than 18 months or reservists who are activated for shorter periods, but with more frequency. The supporters of those proposals make both equity arguments (i.e., activated reservists should not suffer financial harm) and efficiency arguments (i.e., compensation must rise to maintain enlistment and reenlistment). Analyses of activation and earnings based on survey data suggested that most reservists earned less while serving on active duty than they did in their civilian jobs. Inasmuch as this is true, the equity argument posits that this loss is unfair to reservists and their families. Reservists should not suffer serious financial harm as a result of their reserve service.[1]

In contrast, our analysis of administrative data suggests that activation usually leads to substantial earnings gains. By our estimates, about 17 percent of reservists suffer an earnings loss when activated, but the fraction of reservists suffering an earnings loss declines as active duty days served increases. Thus, our findings suggest that earnings loss attributable to activation is much less of a problem than was previ-

[1] It can also be argued that reservists enlist in the reserves knowing that there is some probability that they might be called to active duty. From an equity perspective, it is unclear whether reservists should be compensated for losses that they know could occur. However, it can be argued that the intensive use of the reserves during the GWOT was not foreseeable prior to September 11, 2001, and that these reservists, at least, should be compensated for losses that were not easily anticipated. On these issues, see Appendix G.

ously thought. In the 2004 SOFRC, for example, nearly half of activated reservists reported experiencing an earnings loss. Our findings also suggest that relatively few reservists will be eligible to receive compensation for lost earnings under current law.

Even if earnings loss was more widespread, it is not clear that earnings replacement legislation would result in a more equitable compensation system for reservists. From an equity perspective, earnings replacement would ideally compensate reservists for the difference between military earnings while activated and what they would have earned as civilians had they not been activated. However, determining what these counterfactual civilian earnings are is likely to be difficult. If earnings replacement uses civilian earnings prior to activation as a proxy for what earnings would have been in the absence of activation, our analyses suggest that many activated reservists will receive additional compensation even though their earnings in the absence of activation would have been even lower than what they earned while activated. Recall that 40 percent of reservists who served 0–30 days on active duty in 2000 and 2002/2003 experienced a decline in earnings. Moreover, reservists whose earnings would have increased by an even larger amount had they not been activated would not be compensated for these implicit losses by earnings replacement legislation. Thus, earnings replacement would inevitably overcompensate some reservists and undercompensate others. In the course of addressing one set of inequities, then, earnings replacement would create another set of inequities that could be just as harmful.

As for addressing efficiency arguments, these findings do not necessarily imply that existing reserve compensation is sufficient to maintain the desired reserve force. Even though our estimates suggest that most reservists experience substantial earnings gains, those gains might not be sufficient to compensate reservists for the hardship of activation. The pecuniary (e.g., expenses associated with being away from one's family, loss of spousal earnings, decline in earnings following activation) and nonpecuniary (e.g., emotional cost of family separation, risk of injury) costs of being activated can be substantial. It is unclear whether these own earnings gains will be enough to offset those costs.

More broadly, we should expect that in the future, enlistment and reenlistment in the reserves will be positively correlated with potential earnings gains (or negatively correlated with potential earnings losses).[2] To some extent, the departure from the reserves of reservists with the potential for significant earnings losses is appropriate. Perhaps, reservists who stand to suffer large losses, such as the self-employed or individuals who command large civilian salaries, are not a good match in aggregate for a reserve force that DoD expects to use with some frequency. However, inasmuch as these individuals are in military occupations that are particularly valued by the reserves, targeted compensation to retain desired capabilities and readiness in the reserves may be appropriate.

Future research should consider what kind of compensation reforms are likely to be most cost-effective in attracting and retaining reservists in an era in which the probability of activation is substantially above historical norms. Inasmuch as there is a need to compensate reservists for activation (whether because they have losses or because their financial gains do not offset the pecuniary and nonpecuniary costs of activation), several approaches are possible. One approach would be to increase enlistment and reenlistment bonuses. An alternative would be to increase compensation while activated. Doing so would have the advantage of targeting additional compensation to those reservists who are actually activated and of compensating them at the time of their activation.

Earnings replacement would also provide additional compensation to reservists when activated. However, it targets the funds based on the reservist's value to the civilian employer (as reflected in earnings) rather than on his value to the military. A policy of targeted increases to pay while activated is likely to be more cost-effective for two reasons. First, it will attract those people with the lowest cost to DoD. Second, some people with strong interest in the reserve, but with large losses, might choose to join or remain in the reserves even with a level of compensation well below complete income replacement.

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[2] See Gotz (2004) for a similar argument. See Appendix G and Klerman (2005a, 2005b) for a formal model that derives this result.

Directions for Future Research

The current research leaves a number of important questions unanswered. First, the composition of the activated reserve force will likely change over time, as will the type and magnitude of reserve compensation, thus making it useful to replicate these analyses in 2004 and 2005. SSA earnings data for 2004 become available in February 2006.

Second, policymakers have expressed particular concern about the self-employed and employees of small firms, and current legislation pays special attention to federal government employees. More disaggregated analyses of these and other special subgroups would be beneficial.

Third, the results presented in this report offer a very different characterization of earnings loss attributable to activation than existing survey evidence. Because the congressionally mandated survey on earnings loss fielded in May 2005 (see Chapter 1) employs a similar survey instrument to previous DoD surveys, we expect the results reported here to differ markedly from those survey results as well. The beginning of this chapter discussed a number of reasons why our results might differ from survey evidence. These include treatment of the tax advantage, error in reporting both civilian and military earnings, and nonrandom survey and item response. A more systematic analysis of these differences, perhaps by matching administrative earnings data to the survey responses, could be useful for understanding survey results and for developing future survey instruments.

Fourth, the current study examines how activations impact the earnings of reservists themselves. It seems plausible that activations could also alter the labor supply of the spouses and children of reservists. For example, activations might disrupt child care arrangements, making it difficult for spouses to continue working at the same level they worked before. In future work, RAND will use an approach similar to that used in this report to examine how activations impact spousal and total household earnings.

Fifth, as reservists return from prolonged time on active duty, the policy debate will shift to the effect of activation on the earnings of reservists after they return to civilian life. In this document, we have

reported early estimates in this study on the effect of activation on postactivation earnings. However, those results apply to a select sample of reservists and consider only one year of postactivation earnings. With data on 2004 and 2005 civilian earnings, better and more complete estimates of earnings loss following activation will be possible.

Finally, reservists returning from active duty will eventually need to decide whether to remain in the reserves. Estimating how earnings loss or gain affects retention will provide additional evidence on the importance of financial considerations on reenlistment decisions.

APPENDIX A

Pending Earnings Replacement Legislation

This appendix summarizes earnings replacement legislation before Congress as of September 2005. It is based on digests prepared by OSD/RA.

Table A.1
Earnings Replacement Legislation Introduced to Congress (as of September 2005)

Bill	Title/Subject	Sponsor	Description
S. 11	Standing With Our Troops Act of 2005	Levin	• Continue the existing DoD policy of limiting to a total of 24 months • Correction of RC pay problems • Establishes Deputy Under Secretary of Defense for Personnel and Readiness (Reserve Affairs) • Penalty-free withdrawal from retirement plans • Income tax withholding on differential wage payments • Treatment of differential wage payments for retirement plan purposes • Employee tax credit and replacement employee credit • Differential pay for federal employees serving in support of a contingency • Expand TRICARE Reserve Select to all SelRes and IRRAA • Provide a health insurance stipend when serving in support of a contingency

Table A.1—(continued)

Bill	Title/Subject	Sponsor	Description
S. 38	Guard and Reserve Enhanced Benefits Act	Murray	• Military leave for family of mobilized reservists • Child care for mobilized reservists • SelRes qualify for MGIB AD with 12 continuous months or 24 cumulative months in last 60 months • Increase MGIB-SR to about 40 percent of active-duty MGIB program and use benefit up to five years after separating from SelRes • Defer federal student loans when RC called up for 30 days for a contingency • SCRA type protections for students • Tax credit for employers who pay differential wages • Differential pay for federal employees serving in support of a contingency • Reduce retirement age to 55 • Expand TRICARE Reserve Select to all SelRes and IRRAA • Provide a health insurance stipend when serving in support of a contingency
S. 240	Small Business Military Reservist Tax Credit Act	Kerry	Employer tax credit for paying differential salary and salary for temporary employees
S. 417	Military Reserve Mobilization Income Security Act of 2005	Dorgan	Employer tax credit when employer pays differential salary to reservists serving in support of a contingency
S. 460	Strengthening America's Armed Forces and Military Family Bill of Rights Act	Kerry	Tax credit for employers who pay differential salary to reservists serving in support of a contingency operation
S. 624	Patriot Penalty Elimination Act	Bayh	• Require DoD to pay the difference between average monthly earned civilian income and the average monthly military income (basic pay and earned income) • Reservists must be involuntarily called to active duty and serve at least 6 out of 12 months outside the United States • Provides a tax credit for employers who pay differential wages to a reservist-employee called to active duty or full-time National Guard duty for more than 179 days (other than for training) and has reemployment rights under USERRA

Table A.1—(continued)

Bill	Title/Subject	Sponsor	Description
S. 871 (same as S. 11)	Standing With Our Troops Act	Levin	• Continue the existing DoD policy of limiting to a total of 24 months • Correction of RC pay problems • Establishes Deputy Under Secretary of Defense for Personnel and Readiness (Reserve Affairs) • Penalty-free withdrawal from retirement plans • Income tax withholding on differential wage payments • Treatment of differential wage payments for retirement plan purposes • Employee tax credit and replacement employee credit • Differential pay for federal employees serving in support of a contingence • Expand TRICARE Reserve Select to all SelRes and IRRAA • Provide a health insurance stipend when serving in support of a contingency
S. 981	Reservists Pay Security Act	Durbin	Differential pay for federal employees serving in support of a contingency
S. 989	Reservists Pay Security Act	Durbin	Differential pay for federal employees serving in support of a contingency
S. 1142 (same as H.R. 838)	HOPE at HOME Act	Landrieu	• Differential pay for federal employees performing 90 days or more of active service • Tax credit of 50% of compensation paid to reservist-employees performing active duty (other than for training) • Replacement employee tax credit of 50% (maximum of $12,000) • Treats differential pay as income for tax and retirement plan purposes
H.R. 838 (same as S. 1142)	HOPE at HOME Act	Lantos	• Differential pay tax credit • Replacement employee tax credit • Tax credit for self employed • Differential pay for federal employee serving on active duty for greater than 30 days • Tax treatment of differential pay • Payments to retirement plan while mobilized
H.R. 948	Reserve retirement for state duty	Maloney	• Provide retirement credit for duty performed under Title 32 (presumes this is state active duty)

Table A.1—(continued)

Bill	Title/Subject	Sponsor	Description
H.R. 1102	Patriot Penalty Elimination Act of 2005	Israel	• DoD pays the difference between pre-service earned income and military earned income for RC members involuntarily called to active duty and serve at least 6 out of 12 months OCONUS • Tax credit for employers who pay differential wages
H.R. 1543	Guard and Reserve Enhanced Benefits Act	McGovern	• Military leave for family of mobilized reservists • Child care for mobilized reservists • SelRes members qualify for MGIB AD with 12 continuous months or 24 cumulative months in last 60 months • Increase MGIB-SR to about 40 percent of active duty MGIB program and use benefit up to five years after separating from SelRes • Defer federal student loans when RC called up for more than 30 days in support of a contingency and for 3 months following release from active duty • SCRA type protections for students • Differential pay for federal employees serving in support of a contingency • Tax credit for employers who pay differential wages • Reduce retirement age to 55 • Expand TRICARE Reserve Select to all SelRes and IRRAA • Provide a health insurance stipend when serving in support of a contingency
H.R. 1815	National Defense Authorization Act for Fiscal Year 2005	Hunter	• Require DoD to pay the difference between the average civilian earned income and total military compensation (RMC plus special and incentive pays and any allowances not included in RMC) • Member completes 18 months of involuntary active duty, 24 months in the preceding 60 months or mobilized within 6 months of release from active duty

Table A.1—(continued)

Bill	Title/Subject	Sponsor	Description
H.R. 2131	New GI Bill of Rights for the 21st Century Act	Edwards	• SelRes members qualify for MGIB-AD who accrue 2 years of active duty out of the 5 years for active duty commenced between Sept. 11, 2002 and Dec. 31, 2006 • Provide TRS for all SelRes and IRRAA members • Provide a health insurance stipend when serving in support of a contingency • Increase SelRes health care professionals special pay to $25,000 per year (from $10,000) • Increases SelRes reenlistment bonus to $2,500 per year (up to 6 years at $15,000) • Increases SelRes enlistment bonus to $32,000 (from $10,000) • Increases SelRes affiliation bonus to $15,000 • Authorizes a SelRes referral bonus of $2,500 • Extends AD health care professions special pays to RC health care professions officers • Differential pay for federal employees serving on active duty for more than 30 days • Tax credit for employers who pay differential salary • Tax credit for replacement of a reservist called to military duty
H.R. 2296	Guard and Reserve Financial Stability Act	Lowey	Tax credit for replacement of a reservist called to active duty or full-time National Guard duty for more than 179 days

APPENDIX B

Components of Regular Military Compensation

The body of this report has disaggregated tabulations of military pay and allowances for various groups. This appendix provides a brief description of those pays and the major recent changes.

Sources of the Information

This information was compiled by Jennifer Kavanagh from three sources:

- *Uniformed Services Almanacs* and *Reserve Forces Almanacs* for the years 1999–2005, which are published annually by an independent company, include information on the structure, rates, eligibility, and changes to military pay as well as a summary of major changes in the National Defense Authorization Act for each fiscal year.
- *DoD Financial Management Regulation Volume 7A,* which is published through the Office of the Secretary of Defense, Comptroller's Office (last updated in July 2005), outlines the legislation, precise terms of eligibility, and recent changes/additions for most military pays.
- *Military Compensation Background Papers,* which are published through the Office of the Under Secretary for Personnel and Readiness and updated in May 2005, review the history of all forms of military compensation, including major revisions to eligibility and rates.

Major Components of Pay and Allowances

Here we describe the main components of pay considered in the body of the report. There are many other pays, but they are not important for the basic analysis in this report. For analyses of subgroups (e.g., medical professionals), they might be more important.

Basic Pay

Basic pay is the primary form of military compensation, with rates depending on a member's pay grade and years of service. Basic pay increases yearly based on cost of living calculations and changes in civilian wages. A change in the FY00 Defense Authorization Act, effective January 1, 2002, committed DoD to higher than usual pay increases through FY06. Under the provisions of this act, pay will be increased by 0.5 percentage points more than the change in the Employment Cost Index and higher raises are given to more experienced members who reach their rank with fewer years of service. Each year, certain pay grades may receive targeted increases in addition to the standard increase. Most recently, basic pay was increased 3.5 percent effective January 1, 2005. Effective January 1, 2004, basic pay was increased 3.7 percent, but some midlevel and senior enlisted pay grades along with some warrant officers got targeted increases above this amount, ranging from 4.6 percent to 6.25 percent. The average pay increase in 2004 was 4.1 percent.

Reservist Pay/Drill Pay

Reserve personnel also receive basic pay. Reservists serving on active duty for training, or for operations other than training, and reservists activated in support of contingency operations are paid at the same rate as active duty personnel of comparable pay grades and years of service. Those on inactive duty training are paid at the rate at the "Drill Rate," again based on pay grade, years of service, and number of drills. This comes out to one-thirtieth of the monthly basic pay rate for each IDT period. Pay increases for the Reserves operate the same way as those for active duty. For example, effective January 1, 2005, pay for Reserve component members was increased 3.5 percent.

Basic Allowance for Housing

The Basic Allowance for Housing (BAH) is payable to members on active duty according to their pay grade, dependency status, and geographic location. BAH rates are based on civilian standards, looking at housing choices made by civilians with similar income levels in the same area. BAH is also tax-free. Beginning in 2005, out-of-pocket costs for housing are eliminated at the median cost, for the cost of adequate housing based on rank and family size, in all military housing areas. This is the result of gradual decreases in out-of-pocket BAH costs that began in FY01. There are many regulations governing eligibility for BAH as well as different types of BAH.

- In general, members assigned to government quarters are not entitled to BAH.
- Members who are living in government quarters and not receiving BAH because they are stationed away from their families are eligible to receive partial BAH.
- Partial BAH is also payable to members who do not have dependents, are assigned to single-type adequate government quarters or on sea or field duty, and are not entitled to a full BAH.
- Members who are unmarried and live in single government quarters, who are not otherwise entitled to BAH but pay child support, are entitled to a BAH differential payment. The BAH-DIFF rate is the difference between the with- and without-dependents BAH rates as of December 31, 1997.
- Members who have dependents, but are stationed away from their family, will continue to receive BAH at the with-dependents rate if they live in government quarters. If the member chooses not to live in government quarters, the member is also eligible to receive a Family Separation Housing (FSH) Allowance, equal to the BAH rate for the member's grade without dependents at the duty location. Reservists are also eligible for FSH when called to active duty.
- Effective January 1, 2003, members continue to receive BAH regardless of rank and years of service between permanent duty stations.

- In the case of dual service couples, when the family does not live in government quarters, both members are eligible to receive the BAH rate at the without-dependents rate for their pay grade, and one may claim the with-dependents rate for any children.
- For members on sea duty, those below E6 without dependents are not eligible for BAH while on sea duty except in cases authorized by the Service Secretary (as of October 31, 2002). However, a change in the law effective October 1, 2003, allows two members in a pay grade below E6 who are married to each other and both on sea duty to receive BAH at the without-dependents rate.
- As of FY05 (in the National Defense Authorization Act FY05), members attending Professional Military Education (PME) away from their families are authorized to receive BAH at a rate equal to the most favorable among three options: the BAH rate at the duty station where the training is received, the rate at the member's former duty station, or the rate at the location where the dependents reside during the training.
- Reserve members are also eligible for BAH under certain circumstances. For example, when a Reserve Component member is called to active duty in support of a contingency operation and receives Permanent Change of Station (PCS) authorized transportation of household good orders, BAH will be paid at the new station. If PCS orders are not issued, BAH payments will be based on the primary residence rate at the time of the order. Reserves are also eligible for BAH when called to active duty for 140 days or more.
- BAH II is a specific housing allowance entitlement for members not specifically entitled to full BAH in some cases determined by the Secretary of Defense. For example, Reserve Component members called to active duty for 139 days or less that is not in support of a contingency operation are entitled to BAH-II.
- The Overseas Housing Allowance (OHA) is paid to members stationed overseas at rates based on the Per Diem Travel and Transportation Allowance Committee.
- BAH also replaced payments previously known as the Basic Allowance for Quarters and the Variable Housing Allowance.

Basic Allowance for Subsistence

Basic Allowance for Subsistence (BAS) is payable on a daily rate to qualified enlisted personnel and a monthly rate for qualified officers and is intended to offset the cost of service member meals (but not the meals of the family). BAS is also tax-free. BAS rates are set based on the USDA cost of food index. Entitlement to BAS has changed several times for enlisted personnel in the past ten years. Starting January 1, 1998, enlisted members being "subsisted in kind" became entitled to receive a partial BAS, except during basic training, and members temporarily assigned to duty away from their permanent duty station become entitled to BAS at a rate not less than that at their permanent duty station. Previous accounting rules had meant that some members received less BAS while deployed than while at home base. Further changes made effective January 1, 2002, entitled almost all enlisted personnel to full BAS payments even when deployed, but required personnel to pay for all their meals, even those that are provided by the government. Officers have always been eligible for full BAS at all times.

Members are debited at the BAS rate for their meal costs while deployed or while on sea or field duty. Meal costs for personnel serving on temporary duty are covered by per diem, not BAS. In many cases, commanders give permission to enlisted personnel to "mess separately," depending on such factors as the location of a home and duties, working hours, and distance to the dining facilities. As a result, many enlisted personnel with dependents who lived off base receive Separate Rations (SEPRATS), that is, BAS to compensate for messing separately. Reservists called to active duty are also eligible for BAS at the same rate as active-duty personnel, regardless of the length of call-up. Reservists on inactive-duty training are not eligible for BAS, but enlisted reservists may receive in-kind rations during IDT periods. Rates for 2005 are $8.90 per day for enlisted personnel and $183.99 per month for officer personnel.

Family Separation Housing Allowance (Formerly Family Separation Allowance, Type I)

The purpose of the Family Separation Housing Allowance (formerly known as the Family Separation Allowance, Type 1, or FSA-I) is

intended to compensate members for added housing expenses resulting from enforced separation from dependents. It is payable to members who are on permanent duty outside the United States or in Alaska who meet the following criteria: (1) transportation of dependents to the permanent duty station or a place near the station is not authorized at government expense; (2) dependents do not live at the permanent duty station; (3) adequate government quarters or housing facilities are not available for assignment to a member and inadequate government quarters or housing facilities are not assigned. A revision to the eligibility requirements for this pay in the National Defense Authorization Act extended eligibility to members who serve an unaccompanied tour of duty because a dependent cannot accompany the member due to medical reasons. Reservists called to active duty are eligible for FSA-I, under the same conditions as apply to active-duty personnel, namely for PCS when the family cannot accompany the member and for Temporary Duty (TDY) of longer than 30 days. The amount of FSA-I (FSH) paid is equivalent to the BAH for a member without dependents at the same pay grade. Members may receive both FSA-I (FSH) and FSA-II in the same month.

Family Separation Allowance II

Family Separation Allowance, Type II (FSA-II) is intended to compensate members for the hardship (both financial in the form of additional costs and emotional) of being separated from their families for long periods of time. Members are entitled to FSA-II if one of the following criteria is met: (1) transportation of dependents is not authorized at government expense and the dependents do not live in the vicinity of the member's permanent duty station or the transportation is authorized, but the dependent cannot accompany the member due to medical reasons (effective January 1, 2002 only); (2) the member is aboard ship and this ship is away from the homeport for more than 30 continuous days; (3) the member is on TDY away from the permanent duty station for more than 30 days. A revision to the eligibility requirements for this pay in the National Defense Authorization Act extended eligibility to members who serve an unaccompanied tour of duty because a dependent cannot accompany the member due to medical reasons.

Reservists called to active duty are eligible for FSA-II, under the same conditions as apply to active-duty personnel, namely for PCS when the family cannot accompany the member and for TDY of longer than 30 days. FSA-II was increased to $250 effective October 1, 2002, and was extended several times, most recently to December 31, 2005, in the FY05 Defense Authorization Act. The increase was made permanent in Public Law 108–375 as of January 1, 2006. Members may receive both FSA-I (FSH) and FSA-II in the same month.

Hostile Fire and Imminent Danger Pay

Hostile Fire Pay (HFP) is payable to members on duty in a foreign area who are subjected to hostile fire or the explosion of a hostile mine; near a hostile fire incident and in danger of being subject to hostile fire or mines; killed (payable to their estate), injured, or wounded by hostile fire, mine, or action; or on official duty in a designated imminent danger area. HFP was increased to $225/month for the period October 1, 2003 to December 31, 2004. The temporary increase was extended to December 31, 2005 and made permanent as of January 1, 2006 in the FY05 Defense Authorization Act and Public Law 106–21. Reservists serving on active duty for training, for operations other than training, and reservists activated in support of contingency operations are also eligible for HFP. Furthermore, the FY04 Defense Authorization Act extended this pay retroactive to September 11, 2001 to Reserve Component members at the full monthly rate while performing IDT at duty locations designated for receipt of the pay. Finally, members hospitalized for the treatment of an injury sustained while eligible for pay may continue to receive the pay for up to three months. For a list of locations eligible for HFP, see http://www.defenselink.mil/comptroller/fmr/07a/07a_10.pdf.

Combat Zone Tax Exclusion

This is formally referred to as the Income Tax Withholding Exclusion. Effective at the end of March 1996, the pay of active-duty personnel was no longer subject to federal and state income tax withholdings for any month in which the personnel served in a combat zone or hazardous duty area. Members performing duty in combat zones quali-

fied automatically for the income tax withholding exclusion during the months of duty there. In addition, members not in those areas, but who received HFP and performed duties in direct support of members performing duties in combat zones (for example, ground crews of aircraft flying missions in the combat zone), also qualified for the income tax withholding exclusion. All pay of enlisted members and warrant officers earned in a combat zone is exempt from taxation. For officers, the amount of tax-free income is capped at a rate equal to the highest rate of enlisted pay (plus imminent danger/hostile fire pay received), although this cap affects only the most senior officers. The Military Family Tax Relief Act of 2003 extended the combat zone tax exclusion to all members serving on active duty in support of a contingency operation. Reservists called to active duty and serving on qualifying missions/locations are also eligible for combat zone tax exclusion provisions.

Recent Changes in Pay and Allowances

Finally, Table B.1 describes the recent changes in military pay and allowances. Such changes might partially explain changes over time in our estimates. Table B.2 summarizes recent changes to basic pay.

Table B.1
Recent Changes in Military Pay and Allowances

Pay	Authorizing Legislation	Date Change Effective	Description of Change
Basic Pay	National Defense Authorization Act, FY00	January 1, 2000	Commits DoD to higher than usual pay increases through FY06. Pay will be increased by 0.5 percentage points more than the change in the Employment Cost Index. Also gives higher raises to more experienced members who reach their rank with fewer years of service.
	National Defense Authorization Act, FY05	January 1, 2005	Basic pay was most recently increased 3.5% effective January 1, 2005.
	National Defense Authorization Act FY04	January 1, 2004	Basic Pay increased 3.7%, targeted increase of 4.6 to 6.25% given to personnel in some midgrade to senior enlisted positions and some warrant officers. Average Increase is 4.1%.
	National Defense Authorization Act, FY01	July 1, 2001	Pay grades E5, E6, and E7 receive an additional pay increase of up to an additional 5.5% effective July 1, 2001.
Basic Allowance for Housing	National Defense Authorization Act, FY05	January 1, 2005	Provision of BAH for members attending PME away from their families is changed to allow for rate determination to depend on the most favorable of: the duty station where the training is received, the member's former duty station, or the place where the dependents currently reside.
	National Defense Authorization Act, FY04	October 1, 2003	For members below E6 who are married to each other and both have sea duty, BAH at nondependent rate will be paid to each.
	Interim Change 40-03	January 1, 2003	BAH provided to members regardless of rank/years of service between permanent duty stations.
	National Defense Authorization Act, FY98	January 1, 1998	Members below E6 without dependents on sea duty are not eligible for BAH.
	National Budget Initiative	October 1, 2000	Beginning in FY01 rates increased to eliminate out-of-pocket costs for members by January 1, 2005. [This was achieved.]

Table B.1—(continued)

Pay	Authorizing Legislation	Date Change Effective	Description of Change
Basic Allowance for Subsistence	National Defense Authorization Act, FY01	January 1, 2002	Policy revised so that members receive full BAS but pay for their meals, even those provided by the government
Family Separation Allowance II	Interim Change 18-03; Wartime Supplemental Appropriations Act, 2003	October 1, 2002	Increased to $250 effective October 1, 2002 to September 30, 2003.
	National Defense Authorization Act, FY04	October 1, 2003	Extended increase to $250 for the period October 1, 2003 to December 31, 2004.
	National Defense Authorization Act, FY05; Public Law 108–375	October 28, 2004	Temporary increase in FSA extended to December 31, 2005; made permanent January 1, 2006.
	National Defense Authorization Act, FY02	October 1, 2001	FSA (I/II) may be paid to a member who serves an unaccompanied tour of duty because a dependent cannot accompany the member due to medical reasons.
Hostile Fire/ Imminent Danger Pay	National Defense Authorization Act, FY04	October 1, 2003	Increased to $225 for the period October 1, 2003 to December 31, 2004.
	National Defense Authorization Act, FY05; Public Law 106-21	October 28, 2004	Temporary increase in extended to December 31, 2005; made permanent January 1, 2006.
	National Defense Authorization Act, FY04	Retroactive to September 11, 2001	Pay extended retroactively to September 11, 2001 to Reserve Component members on IDT at the full monthly rate for those who perform IDT at duty locations designated for the receipt of special pay.
	National Defense Authorization Act, FY04	November 2004	Members who are hospitalized due to an injury sustained while eligible for the special pay will continue to receive the pay for up to three additional months while hospitalized.

Table B.2
Recent Changes to Basic Pay

Effective	Increase in Pay	Increase in Pay Due to Employment Cost Index[a]	Increase Above Inflation (ECI) for Average Pay Increase	Targeted Increases in Pay
January 1999	3.6%	3.6%	0.0%	
January 2000[c]	4.8%	4.3%	0.5%	
July 2000[b]	Up to 5.5% (average 1.4%)	0.0%	1.4%	Apply to targeted pay grades ONLY[b]
January 2001	3.7%	3.2%	0.5%	
July 2001[b]	0.4%	0.0%	0.4%	Increase for E5–E7 personnel ONLY[b]
January 2002	At least 6.0% for enlisted and at least 5.0% for officers (average 6.9%)	4.1%	2.8%	Midgrade officers and midgrade and senior enlisted personnel receive increases of up to 10.0%
January 2003	At least 4.1% (average 4.7%)	3.6%	1.1%	Midgrade officers and midgrade and senior enlisted members receive increases up to 6.5%
January 2004	At least 3.7% (average 4.14%)	3.2%	0.94%	Midgrade and senior enlisted members as well as some warrant officers receive increases of 4.6% to 6.25%.
January 2005	3.5%	3.0%	0.5%	
January 2006	3.1%	2.6%	0.5%	

[a] The Employment Cost Index (ECI) is a measure of the change in the cost of labor and does not include the influence of employment shifts among occupations and industries. The ECI used for the military pay raise is the ECI for wages and salaries of private industry workers measured from September to September of the second year preceding the pay raise. For example, the ECI for Sept. 99 to Sept. 00 determines the pay raise for FY02. For more information about the ECI, see www.bls.gov.

[b] These pay increases apply to specific pay grades only.

[c] In the FY00 National Defense Authorization Act, DoD committed itself to increasing military pay by at least 0.5 percentage points more than the change in the Employment Cost Index through FY06. Larger, targeted increases will be provided to certain pay grades.

APPENDIX C

Some Technical Results on Estimation

This appendix collects some more technical material about the methods used to estimate the effects of activation reported in the body of the paper. The first section of this appendix discusses the relation of our methods to the conventional econometric difference-in-differences (DiD) estimator (e.g., Meyer, 1995). The second section of this appendix discusses the improved estimates of net effects.

Relation to the Conventional Difference-in-Differences Estimator

In the language of econometrics, our estimates of net effects are a difference-in-difference (DiD) estimator (Meyer, 1995). Our approach would be exactly correct if earnings could be written as:

$$y_{i,t} = \alpha + \delta_{i,t} + \mu_i + \tau_t + \varepsilon_{i,t} \qquad \text{(C.1)}$$

where i indexes individuals and t indexes time periods (in our case, calendar years, corresponding to the available SSA data). The δs are dummy variables for the effect of being activated for d days (where we have grouped the days). We write $\delta_{i,t}$ with an i,t subscript to emphasize that the appropriate number of days is a function of the experiences of individual i in period t. The μ is an individual specific fixed effect, τ is a period specific fixed effect, and ε is an individual-period specific residual (again with an i,t subscript).

Then, consider estimating the effect of being activated 271 or more days in the "out year"—*oyr*, relative to not being activated (defined as 30 or less days on active duty) in the "base year"—*byr*. For that case, the gross effect is a simple (i.e., single) difference:

$$\Delta y^{e}_{i,byr,oyr} = \frac{1}{N_e}\sum_{i=1}^{N_e}(y^{e}_{i,oyr} - y^{e}_{i,byr}) = (\delta_{271+} - \delta_{0-30}) + (\tau_{2003} - \tau_{2000}) + \frac{1}{N_e}\sum_{i=1}^{N_e}(\varepsilon^{e}_{i,oyr} - \varepsilon^{e}_{i,byr}) \quad \text{(C.2)}$$

where the *e* superscript is for the "experimental group". The first term is the effect of activation. By definition, the experimental group was on active duty 0–30 days in 2000 and 271+ days in 2003. The second term (the τs) captures pure period effects (e.g., changes in military compensation, changes in civilian wages due to the business cycle). They will also include the effect of aging (e.g., gains in civilian experience and tenure, and increases in years of military service and promotion). With large enough samples, the last term (the εs) will converge to zero.

Finally, the motivation for differencing is that the constant, α, and the individual specific effects, μ, drop out. Thus, the estimates of δ will be unbiased (and consistent) even if those who are activated differ systematically from those who are not activated. This is the standard argument for fixed effects (Meyer, 1995; Hsiao, 2003).

Given this model, we can do better. Note that we can write the same expression for the control group. By definition, they were activated 0–15 days in 2000 and in 2003:

$$\Delta y^{c}_{j,byr,oyr} = \frac{1}{N_c}\sum_{j=1}^{N_c}(y^{c}_{j,oyr} - y^{c}_{j,byr}) = (\tau_{oyr} - \tau_{byr}) + \frac{1}{N_c}\sum_{j=1}^{N_c}(\varepsilon^{c}_{j,oyr} - \varepsilon^{c}_{j,byr}) \quad \text{(C.3)}$$

where the *c* superscript is for the "control group" and we switch to a *j* subscript to index individuals in the control group. For this group, activated days are 0–30 in both years, so the first term (the δs) drops out. Again, the constant, α, and the individual specific effects, μ, drop out. Note also that, by assumption, the (remaining) first term (the τs) is identical to the second term of the previous expression. Again, with large enough samples, the last term (the εs) will converge to zero.

Thus, differencing across the two equations yields:

$$
\begin{aligned}
\Delta\Delta y^{n}_{byr,oyr} &= \Delta y^{e}_{byr,oyr} - \Delta y^{c}_{byr,oyr} \\
&= \frac{1}{N_e}\sum_{i=1}^{N_e}\{y^{e}_{i,oyr} - y^{e}_{i,byr}\} - \frac{1}{N_c}\sum_{j=1}^{N_c}\{y^{c}_{i,oyr} - y^{c}_{i,byr}\} \\
&= \{(\delta_{271+} - \delta_{0-30}) + (\tau_{oyr} - \tau_{byr}) + \frac{1}{N_e}\sum_{i=1}^{N_e}(\varepsilon^{e}_{i,oyr} - \varepsilon^{e}_{i,byr})\} \qquad \text{(C.4)} \\
&\quad - \{\qquad\qquad (\tau_{oyr} - \tau_{byr}) + \frac{1}{N_c}\sum_{j=1}^{N_c}(\varepsilon^{c}_{j,oyr} - \varepsilon^{c}_{j,byr})\} \\
&= (\delta_{271+} - \delta_{0-30}) + \{\frac{1}{N_e}\sum_{i=1}^{N_e}(\varepsilon^{e}_{i,oyr} - \varepsilon^{e}_{i,byr}) - \frac{1}{N_c}\sum_{j=1}^{N_c}(\varepsilon^{c}_{j,oyr} - \varepsilon^{c}_{j,byr})\}
\end{aligned}
$$

where the *n* superscript is for "net effect." The first term (the δs) is what we want and (again, in large enough samples) the last term (the εs) will converge to zero.

This approach is actually considerably more general than the standard DoD approach. The standard DoD approach would specify a linear effect for days and common time dummies for the entire sample. By grouping rather than including a continuous regressor, our approach (implicitly) allows for nonlinearities in the effect of days. Furthermore, in practice, we estimate separate effects for each group for each pair of years. For the approach to be exact, we only require that that effect of days (within groups) be additive in this pair of years.

Heterogeneity in Gross Effects

Our discussion in Chapter 3 notes that variation across years could be due to compositional changes. Here we formalize that argument.

Our analysis divides the population of reservists into groups (usually by component and rank). For each group, for each base-year/out-year pair, we estimate a mean gross effect γ:

$$
\hat{\gamma}^{gross}_{g,byr,oyr} = \frac{1}{N_g}\sum_{i=1}^{N_g}(y_{oyr,i} - y_{byr,i}) \qquad \text{(C.5)}
$$

where the summation is over everyone in the group. Then, the overall (grand) mean gross effect is simply:

$$\hat{\gamma}^{gross}_{byr,oyr} = \sum_{g=1}^{G} \left\{ \frac{N_{g,byr,oyr}}{\sum_{h=1}^{G} N_{h,byr,oyr}} \right\} \hat{\mu}^{gross}_{g,byr,oyr} = \sum_{g=1}^{G} w_{g,byr,oyr} \, \hat{\mu}^{gross}_{g,byr,oyr} \tag{C.6}$$

where the weights are defined as:

$$w_{g,byr,oyr} = \frac{N_{g,byr,oyr}}{\sum_{h=1}^{G} N_{h,byr,oyr}} \tag{C.7}$$

As was noted in Chapter 3, gross effects vary across the groups. In addition, the distribution of groups activated in each year (i.e., the weights) also varies. We would like to understand the extent to which variation in overall mean gross effects is due to composition (i.e., the weights/who is activated) versus changes in the gross effects for the groups. That natural approach to this problem is a shift share analysis. We take 2000/2003 as our focal group. Then, the pure effect of composition is:

$$\hat{\gamma}^{gross}_{byr,oyr} = \sum_{g=1}^{G} w_{g,byr,oyr} \, \hat{\mu}^{gross}_{g,2000,2003} \tag{C.8}$$

And the pure effect of changes in within-group mean effects is:

$$\hat{\gamma}^{gross}_{byr,oyr} = \sum_{g=1}^{G} w_{g,2000,2003} \, \hat{\mu}^{gross}_{g,byr,oyr} \tag{C.9}$$

Heterogeneity in Percentage Changes

Consider the problem of estimating the average percentage change in earnings with activation. The naive approach would use the aggregate means.

$$\tilde{\rho}_{gross} = \frac{\frac{1}{N}\sum_{i=1}^{N}(y_{oyr,i} - y_{byr,i})}{\frac{1}{N}\sum_{i=1}^{N} y_{byr,i}} \tag{C.10}$$

where we use a tilde ("~") to denote the naive estimator.

This naive estimator is clearly wrong. The average of the percentage change is not equal to the percentage change of the averages. Instead, we want the average of the percentage changes. More formally, we can compute the percentage change within each group as:

$$\hat{\rho}^{\,g}_{gross} = \frac{\frac{1}{N_g}\sum_{i=1}^{N}(y_{oyr,i} - y_{byr,i})}{\frac{1}{N_g}\sum_{i=1}^{N} y_{byr,i}} \tag{C.11}$$

where the summations are over all individuals in group *g*. Then, the aggregate percentage change is the weighted average of these group-specific percentage changes[1]:

$$\hat{\rho}_{gross} = \frac{1}{\sum_{g=1}^{G} N_g} \sum_{g=1}^{G} N_g \hat{\rho}^{\,g}_{gross} \tag{C.12}$$

Estimating Aggregate Net Effects

Analogous issues arise in estimating the aggregate net effect on earning (not on percentage changes). Begin by defining the average effect, *for a group,* in those activated and those not activated. By analogy to (B.5), they are respectively:

$$\hat{\gamma}^{\,activated}_{g,byr,oyr} = \frac{1}{N_g^{activated}} \sum_{i=1}^{N_g^{activated}} (y_{i,oyr}^{activated} - y_{i,oyr}^{activated}) \tag{C.13}$$

$$\hat{\gamma}^{\,unactivated}_{g,byr,oyr} = \frac{1}{N_g^{unactivated}} \sum_{j=1}^{N_g^{unactivated}} (y_{j,oyr}^{unactivated} - y_{j,oyr}^{unactivated}) \tag{C.14}$$

---

[1] Note that, here and throughout our analysis, we ignore any within-group heterogeneity. As with all earnings measures, there is considerable within-group income variability. SSA reports back to us, not only the mean earnings in a group, but also the variance (or standard error). However, in this analysis, we ignore any such heterogeneity. It may be possible to make assumptions such that one could also incorporate within-group heterogeneity. We do not attempt to do so here.

To fix ideas, in our analyses note that the activated group is most commonly people on active duty 0–30 days in the base year (2000) and more than 270 days in the out year (2003). The unactivated group is most commonly people on active duty 0–30 days in the base year and in the out year. Note that, since the two summations are over different groups of people with different numbers of elements, we deliberately use different subscripts: "*i*" for activated, and "*j*" for unactivated.

Given this notation, the net effect *for a group* is:

$$\begin{aligned}\hat{\gamma}^{\,g}_{net} &= \hat{\gamma}^{\,activated}_{g,byr,oyr} - \hat{\gamma}^{\,unactivated}_{g,byr,oyr} \\ &= \frac{1}{N_g^{activated}} \sum_{i=1}^{N_g^{activated}} \left(y_{i,oyr}^{activated} - y_{i,oyr}^{activated}\right) \\ &- \frac{1}{N_g^{unactivated}} \sum_{j=1}^{N_g^{unactivated}} \left(y_{j,oyr}^{unactivated} - y_{j,oyr}^{unactivated}\right)\end{aligned} \tag{C.15}$$

Then, the (improved) aggregate net effect is the weighted sum of these group-specific net effects:

$$\hat{\gamma}_{net} = \frac{1}{\sum_{h=1}^{G} N_h^{activated}} \sum_{g=1}^{G} N_g^{activated}\, \hat{\gamma}^{\,g}_{net} = \sum_{g=1}^{G} w_g^{activated}\, \hat{\gamma}^{\,g}_{net} \tag{C.16}$$

Since our concept of interest is the effect of treatment on the treated, the appropriate weights for the weighted sum are given by the number of experimentals/activated reservists, not by the numbers of controls:

$$w_g^{activated} = \frac{N_g^{activated}}{\sum_{h=1}^{G} N_h^{activated}} \tag{C.17}$$

By analogy, weights for the controls/unactivated reservists would be:

$$w_g^{unactivated} = \frac{N_g^{unactivated}}{\sum_{h=1}^{G} N_h^{unactivated}} \tag{C.18}$$

The Naive Estimator as Incorrect Weights

The difference between the naive and improved estimators can be viewed as an issue of how to weight the unactivated groups:

$$
\begin{aligned}
\hat{\gamma}^{net}_{byr,oyr} &= \sum_{g=1}^{G} w^{activated}_{g,byr,oyr}\, \hat{\gamma}^{net}_{g,byr,oyr} \qquad \text{(C.19)}\\
&= \sum_{g=1}^{G} w^{activated}_{g,byr,oyr}\, \{\hat{\gamma}^{activated}_{g,byr,oyr} - \hat{\gamma}^{unactivated}_{g,byr,oyr}\}\\
&= \sum_{g=1}^{G} \{w^{activated}_{g,byr,oyr}\, \hat{\gamma}^{activated}_{g,byr,oyr}\} - \sum_{g=1}^{G} \{w^{activated}_{g,byr,oyr}\, \hat{\gamma}^{unactivated}_{g,byr,oyr}\}\\
&\neq \sum_{g=1}^{G} \{w^{activated}_{g,byr,oyr}\, \hat{\gamma}^{activated}_{g,byr,oyr}\} - \sum_{g=1}^{G} \{w^{unactivated}_{g,byr,oyr}\, \hat{\gamma}^{unactivated}_{g,byr,oyr}\}\\
&= \left\{ \sum_{g=1}^{G} \left(\frac{N^{activated}_{g,byr,oyr}}{\sum_{h=1}^{G} N^{activated}_{h,byr,oyr}} \right) \sum_{i=1}^{N^{activated}_{g,byr,oyr}} \frac{(y_{i,g,oyr} - y_{i,g,byr})}{N^{activated}_{g,byr,oyr}} \right\} - \left\{ \sum_{g=1}^{G} \left(\frac{N^{unactivated}_{g,byr,oyr}}{\sum_{h=1}^{G} N^{unactivated}_{h,byr,oyr}} \right) \sum_{j=1}^{N^{unactivated}_{g,byr,oyr}} \frac{(y_{j,g,oyr} - y_{j,g,byr})}{N^{unactivated}_{g,byr,oyr}} \right\}\\
&= \left\{ \frac{1}{\sum_{h=1}^{G} N^{activated}_{h,byr,oyr}} \sum_{g=1}^{G} \sum_{i=1}^{N^{activated}_{g,byr,oyr}} (y_{i,g,oyr} - y_{i,g,byr}) \right\} - \left\{ \frac{1}{\sum_{h=1}^{G} N^{unactivated}_{h,byr,oyr}} \sum_{g=1}^{G} \sum_{j=1}^{N^{unactivated}_{g,byr,oyr}} (y_{j,g,oyr} - y_{j,g,byr}) \right\}\\
&= \left\{ \frac{1}{N^{activated}_{byr,oyr}} \sum_{m=1}^{N^{activated}_{m,byr,oyr}} (y_{m,oyr} - y_{m,byr}) \right\} - \left\{ \frac{1}{N^{unactivated}_{byr,oyr}} \sum_{p=1}^{N^{unactivated}_{p,byr,oyr}} (y_{p,oyr} - y_{p,byr}) \right\} = \tilde{\gamma}^{net,naive}_{byr,oyr}
\end{aligned}
$$

where,

$$
N^{activated}_{byr,oyr} \equiv \sum_{h=1}^{G} N^{activated}_{h,byr,oyr};\; N^{unactivated}_{byr,oyr} \equiv \sum_{h=1}^{G} N^{unactivated}_{h,byr,oyr} \qquad \text{(C.20)}
$$

This ugly sequence of expressions conveys a simple point. Begin by working from the top down. The first equality simply repeats the definition of the (nonnaive) net effect as the weighted average of the group net effects, where the weights are given by the relative size of the experimentals/activated reservists. The second equality substitutes back in from the definition of a net effect at the group level, as the difference between the effect among the experimentals/activated reservists and the controls/unactivated reservists. The third equality simply distributes the summation.

Now work from the bottom up. The last equality is the definition of the naive net effect estimator. It is the difference between two terms. The first term is the average change between the base year and the out year in the experimental group/activated reservists; defined as a simple average over all experimentals/activated reservists. Analogously, the second term is the average change between the base year and the out year in the control group/unactivated reservists; again, defined as the simple average over all controls/unactivated reservists.

From the last line to the second to last line, we simply rewrite the simple sums—over all experimentals and over all controls—as double summations over groups and then over individuals within each group. We also rewrite the simple sample size as the sum of the sample size in each group.

From the second to last line to the third to last line is simple algebra. It attempts to restate the naive net estimator in a form as similar as possible to the derived expression for the improved net estimator in the third line. Specifically, it rearranges the order of the summations and multiplies the top and bottom of the leading fractions by a common expression—the number of observations in each group.

The fourth to last line then rewrites this expression in terms of group means and experimental/control weights.

Now inspect the two expressions on either side of the inequality. The first terms (for the experimental group/activated reservists) are identical. The second terms differ only in the weights used. The improved net estimator uses the experimental group/activated reservist weights. This appropriate for estimating the effect of treatment on the treated. The naive net estimator uses the control group/unactivated reservist weights. This is not appropriate.

This is the advantage of the improved estimator over the naive estimator.

We noted earlier that this algebra has a simple intuitive explanation. We want to compare each group's actual change in earnings with what their change in earnings would have been if they had not been activated. We do this within groups. Thus, the weights should be according to the number of people *activated* in each group (i.e., the improved estimator).

Our Presentation of Net Effects

Given this discussion, we present three different net effect estimators. First, we present the naive net effect estimator:

$$\tilde{\gamma}^{net,naive}_{byr,oyr} = \left\{ \frac{1}{N^{activated}_{byr,oyr}} \sum_{i=1}^{N^{activated}_{byr,oyr}} (y_{i,oyr} - y_{i,byr}) - \frac{1}{N^{unactivated}_{byr,oyr}} \sum_{j=1}^{N^{unactivated}_{byr,oyr}} (y_{j,oyr} - y_{j,byr}) \right\} \quad \text{(C.21)}$$

This is the estimator that ignores the subgroups. It computes net effects as the difference between the gross effect for everyone activated and the gross effect for everyone not activated.

Second, we present the improved net effects estimator:

$$\begin{aligned} \hat{\gamma}^{net,improved}_{byr,oyr} &= \frac{1}{\sum_{g=1}^{G} N^{activated}_{g,byr,oyr}} \sum_{g=1}^{G} N^{activated}_{g,byr,oyr} \hat{\gamma}^{net}_{g,byr,oyr} \quad \text{(C.22)} \\ &= \frac{1}{\sum_{g=1}^{G} N^{activated}_{g,byr,oyr}} \sum_{g=1}^{G} N^{activated}_{g,byr,oyr} \left\{ \frac{1}{N^{activated}_{g,byr,oyr}} \sum_{i=1}^{N^{activated}_{g,byr,ory}} (y_{i,oyr} - y_{i,byr}) \right. \\ &\qquad \left. - \frac{1}{N^{unactivated}_{g,byr,oyr}} \sum_{j=1}^{N^{unactivated}_{g,byr,oyr}} (y_{j,oyr} - y_{j,byr}) \right\} \end{aligned}$$

Analogy to Conventional Econometrics

The conventional approach to this issue in labor econometrics is to transform the dependent variable so that the effect in all groups is a single, common, parameter. In practice, most effects are assumed to be proportional, so the dependent variable is specified as the log of the concept of interest.

We do not take this approach for three complementary reasons. First, our approach is easily implemented given that we only have access to grouped results from SSA. Second, our approach is more flexible. We estimate separate coefficients for many strata. The conventional assumption of constant, multiplicative, effects seems unattractive for this problem on a priori grounds. Why should military earnings be (in some sense) proportional to civilian earnings—as would be required for proportionality? In practice, our empirical results decisively reject proportionality.

Third, we can estimate separate effects for each component-rank group. In most empirical analyses, samples are not large enough to estimate separate effects. Instead, the analyst implicitly "borrows strength" across groups by pooling the data and estimating a common effect, using some plausible functional form (e.g., the logged dependent variable implicitly assumes proportional effects). Thus, we can and do estimate our effects at the group level and then construct aggregates. Our samples are large enough to allow us to estimate—relatively precisely—separate effects for each group. Thus, we can and do estimate our effects at the group level and then construct aggregates.

APPENDIX D

Alternative Base Years

This appendix presents selected results employing 2001 and 2002 as base years.

Base Year 2001

Table D.1
Gross Effects, by Out Year and Active-Duty Days: Base Year 2001

Active-Duty Days	Base-Year Earnings		Out-Year Earnings		Gross Effect	
	Out Year		Out Year		Out Year	
	2002 ($)	2003 ($)	2002 ($)	2003 ($)	2002 ($)	2003 ($)
31–90	45,568	43,954	49,072	48,620	3,504	4,666
91–180	29,028	40,763	35,523	49,813	6,496	9,051
181–270	34,106	38,963	45,249	53,169	11,143	14,205
271+	40,143	37,367	58,569	60,127	18,426	22,760
31+	38,966	40,198	45,619	53,683	6,653	13,485

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2001.

Table D.2
Reweighted Gross Effects, by Out Year and Active-Duty Days: Base Year 2001

Active-Duty Days	Base-Year Earnings		Out-Year Earnings		Gross Effect	
	Out Year		Out Year		Out Year	
	2002 ($)	2003 ($)	2002 ($)	2003 ($)	2002 ($)	2003 ($)
31–90	39,791	40,512	42,883	45,137	3,091	4,624
91–180	36,202	40,570	43,099	49,506	6,897	8,936
181–270	37,333	40,130	49,558	54,397	12,226	14,267
271+	38,535	39,273	56,540	62,429	18,005	23,156
31+	38,400	40,198	48,884	53,683	10,484	13,485

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2001. All figures are weighted according to the overall distribution of reservists by rank and component serving more than 30 days of active-duty service in 2003.

Table D.3
Net Effects, by Out Year and Active-Duty Days: Base Year 2001

Active-Duty Days	Out Year	
	2002 ($)	2003 ($)
31–90	2,231	3,408
91–180	5,246	7,518
181–270	9,874	12,575
271+	16,923	21,291
31+	5,367	12,038

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2001. The net effect is the weighted average of net effects computed within rank and component groups.

Table D.4
Reweighted Net Effects, by Out Year and Active-Duty Days: Base Year 2001

Active-Duty Days	Out Year	
	2002 ($)	2003 ($)
31–90	1,843	3,179
91–180	5,649	7,490
181–270	10,977	12,821
271+	16,756	21,709
31+	9,236	12,039

NOTE: Sample restricted to reservists serving 0–30 active duty days in 2001. The net effect is the weighted average of net effects computed within rank and component groups. This mean net effect is then reweighted according to the overall distribution of reservists by rank and component serving more than 30 days of active-duty service in 2003.

Table D.5
Percentage of Reservists Experiencing Any Earnings Loss, Loss Greater than $10,000, or Loss Greater than 10 Percent of Base-Year Earnings, by Out Year and Active-Duty Days: Base Year 2001

Active-Duty Days	2002			2003		
	% Any	% >$10k	% >10%	% Any	% >$10k	% >10%
31–90	24	7	14	25	9	16
91–180	16	4	10	19	7	12
181–270	14	4	8	13	5	8
271+	12	4	7	7	2	4
31+	19	6	11	15	6	10

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2001.

Table D.6
Reweighted Percentage of Reservists Experiencing Any Earnings Loss, Loss Greater than $10,000, or Loss Greater than 10 Percent of Base-Year Earnings, by Out Year and Active-Duty Days: Base Year 2001

Active-Duty Days	2002			2003		
	% Any	% >$10k	% >10%	% Any	% >$10k	% >10%
31–90	25	7	16	25	9	17
91–180	18	6	11	19	7	12
181–270	14	4	8	13	5	8
271+	11	4	6	7	3	4
31+	17	5	10	15	6	10

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2001. All figures are weighted according to the overall distribution of reservists by rank and component serving more than 30 days of active-duty service in 2003.

Table D.7
Net Loss, by Out Year and Active-Duty Days: Base Year 2001

Active-Duty Days	2002			2003		
	% Any	% >$10k	% >10%	% Any	% >$10k	% >10%
31–90	–15	–2	–8	–16	–5	–12
91–180	–23	–4	–15	–22	–7	–16
181–270	–25	–4	–16	–28	–9	–21
271+	–27	–5	–16	–34	–11	–25
31+	–19	–3	–11	–26	–8	–19

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2001. The net loss is the weighted average of net losses computed within rank and component groups.

Table D.8
Reweighted Net Loss, by Out Year and Active-Duty Days: Base Year 2001

Active-Duty Days	2002			2003		
	% Any	% >$10k	% >10%	% Any	% >$10k	% >10%
31–90	–14	–2	–7	–16	–5	–12
91–180	–22	–3	–12	–22	–7	–16
181–270	–25	–4	–15	–28	–9	–21
271+	–28	–5	–17	–34	–11	–25
31+	–22	–4	–13	–26	–8	–19

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2001. The net loss is the weighted average of net losses computed within rank and component groups. This mean net loss is then reweighted according to the overall distribution of reservists by rank and component serving more than 30 days of active-duty service in 2003.

Base Year 2002

Table D.9
Gross Effects, by Out Year and Active-Duty Days: Base Year 2002

	Base-Year Earnings	Out-Year Earnings	Gross Effect
	Out Year	Out Year	Out Year
Active-Duty Days	2003 ($)	2003 ($)	2003 ($)
31–90	42,207	45,160	2,953
91–180	33,617	40,026	6,410
181–270	35,991	48,815	12,824
271+	36,015	57,170	21,156
31+	37,340	48,659	11,319

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2002.

Table D.10
Reweighted Gross Effects, by Out Year and Active-Duty Days: Base Year 2002

	Base-Year Earnings	Out-Year Earnings	Gross Effect
	Out Year	Out Year	Out Year
Active-Duty Days	2003 ($)	2003 ($)	2003 ($)
31–90	37,883	40,725	2,841
91–180	36,432	43,013	6,581
181–270	37,014	49,900	12,887
271+	37,632	58,975	21,343
31+	37,340	48,659	11,319

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2002. All figures are weighted according to the overall distribution of reservists by rank and component serving more than 30 days of active-duty service in 2003.

Table D.11
Net Effects, by Out Year and Active-Duty Days: Base Year 2002

	Out Year
Active-Duty Days	2003 ($)
31–90	2,453
91–180	5,642
181–270	12,068
271+	20,542
31+	10,682

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2002. The net effect is the weighted average of net effects computed within rank and component groups.

Table D.12
Reweighted Net Effects, by Out Year and Active-Duty Days: Base Year 2002

	Out Year
Active-Duty Days	2003 ($)
31–90	2,205
91–180	5,945
181–270	12,250
271+	20,706
31+	10,683

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2002. The net effect is the weighted average of net effects computed within rank and component groups. This mean net effect is then reweighted according to the overall distribution of reservists by rank and component serving more than 30 days of active-duty service in 2003.

Table D.13
Percentage of Reservists Experiencing Any Earnings Loss, Loss Greater than $10,000, or Loss Greater than 10 Percent of Base-Year Earnings, by Out Year and Active-Duty Days: Base Year 2002

	2003		
Active-Duty Days	% Any	% >$10k	% >10%
31–90	26	7	15
91–180	17	4	10
181–270	12	3	6
271+	7	2	3
31+	15	4	8

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2002.

Table D.14
Reweighted Percentage of Reservists Experiencing Any Earnings Loss, Loss Greater than $10,000, or Loss Greater than 10 Percent of Base-Year Earnings, by Out Year and Active-Duty Days: Base Year 2002

	2003		
Active-Duty Days	% Any	% >$10k	% >10%
31–90	26	6	15
91–180	18	5	10
181–270	12	3	6
271+	7	2	3
31+	15	4	8

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2002. All figures are weighted according to the overall distribution of reservists by rank and component serving more than 30 days of active-duty service in 2003.

Table D.15
Net Loss, by Out Year and Active-Duty Days: Base Year 2002

	2003		
Active-Duty Days	% Any	% >$10k	% >10%
31–90	–18	–3	–11
91–180	–26	–5	–17
181–270	–31	–6	–20
271+	–38	–7	–24
31+	–28	–5	–18

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2002. The net loss is the weighted average of net losses computed within rank and component groups.

Table D.16
Reweighted Net Loss, by Out Year and Active-Duty Days: Base Year 2002

	2003		
Active-Duty Days	**% Any**	**% >$10k**	**% >10%**
31–90	–17	–3	–11
91–180	–26	–5	–17
181–270	–32	–6	–20
271+	–37	–7	–23
31+	–28	–5	–18

NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2002. The net loss is the weighted average of net losses computed within rank and component groups. This mean net loss is then reweighted according to the overall distribution of reservists by rank and component serving more than 30 days of active-duty service in 2003.

APPENDIX E

An Alternative Measure of Net Loss

The net loss results in Chapter 5 give the change in the probability a reservist will experience an earnings loss with activation. One might also want to know what fraction of reservists who experienced an earnings loss while activated would have experienced an earnings loss of a smaller magnitude had they not been activated. These reservists would be unambiguously worse off because of activation (at least in terms of earnings). To compute this statistic, we would need information on the joint distribution of earnings changes between the activated and non-activated states. However, in the out year, we only observe reservists in one state or the other (i.e., activated or not activated), and so we cannot compute this joint distribution directly from the individual-level data. Additional and strong assumptions are needed. This appendix provides a discussion of the issues and some illustrative calculations.

Any inference about the distribution of net changes will require some additional assumptions. Heckman and his coauthors have explored additional assumptions about the correlation between earnings in the two states of the world (conditional or covariates).[1] For our analysis, it seems plausible to consider the case where earnings changes from the base year to the out year are assumed to be independent. Given that the earnings changes in question involve sectors of the economy with

[1] See Heckman, Smith, and Clements (1997), Heckman and Smith (1998), and Heckman, LaLonde, and Smith (1999). They note that the conventional econometric dummy variable model implicitly assumes perfect correlation. Furthermore, they argue that optimization induces a positive correlation in the unobservable. Further exploration of the appropriateness of the independence assumption (or some alternative assumption) is a potentially fruitful direction for future analysis.

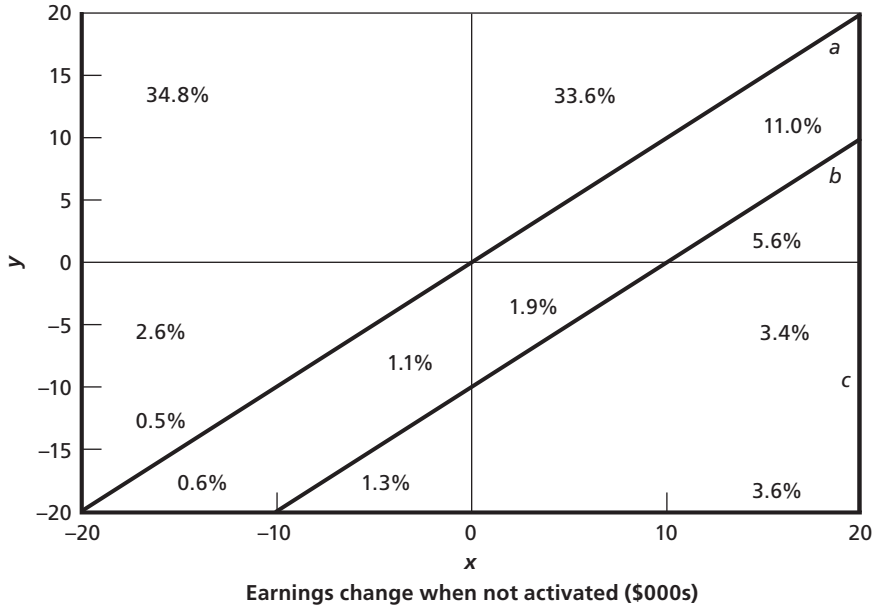
very different institutional characteristics (i.e., the civilian sector versus the military sector), the assumption of independence might be approximately valid. Nonetheless, to bound our estimates, we also report estimates below generated under the assumption that the joint distributions of earnings changes are perfectly positively correlated.

To compute the joint distribution of earnings changes between 2000 and 2002/2003 (assuming independence), we proceed as follows. Within each component-rank-group, we take random draws from the distributions of earnings changes for the activated group (i.e., those serving 0–30 active-duty days in 2000 and more than 30 active-duty days in 2002/2003) and for the nonactivated group (i.e., those serving 0–30 active-duty days in 2000 and in 2002/2003).[2] We summarize this joint distribution in Figures E.1 and E.2, which plot earnings changes when activated on the vertical axis and earnings changes when not activated on the horizontal axis. Figure E.1 plots these earnings changes in level terms and Figure E.2 plots these earnings changes as a percentage of baseline earnings.

Draws from the joint distribution of earnings changes that lie above the 45-degree lines drawn through the origins of the figures represent reservists with larger earnings gains (smaller earnings losses) when activated than when not activated. Following this procedure, we find that about 65 percent of all draws from this joint distribution lie above the 45-degree line. Thus, the figures imply that 65 percent of activated reservists experience larger gains in earnings (smaller losses

[2] Given the assumption of independence, it is trivial to go from the univariate distributions to the bivariate distribution (i.e., two independent random draws). Specifically, for the experimental group (i.e., those activated 0–30 days in 2000 and more than 30 days in 2002/2003) and also for the control group (i.e., those activated 0–30 days in 2000 and in 2002/2003), we compute the probability of a change in 10 bands (for dollar changes and percentage changes). The bands for dollar changes are less than –$20,000, –$20,000 to –$10,000, –$10,000 to –$5,000, –$5,000 to –$2,500, –$2,500 to $0, $0 to $2,500, $2,500 to $5,000, $5,000 to $10,000, $10,000 to $20,000, and over $20,000. The bands for percentage changes are less than –40%, –40% to –30%, –30% to –20%, –20% to –10%, –10% to 0%, 0% to 10%, 10% to 20%, 20% to 30%, 30% to 40%, and over 40%. We then draw a random number. It determines the band. Within the band, we assume a uniform distribution and determine the earnings change that corresponds to the random number. For open intervals we assume $30,000 as largest value for absolute earnings change and 50 percent for absolute percentage change.

Figure E.1
Distribution of Absolute Earnings Change When Activated and Not Activated



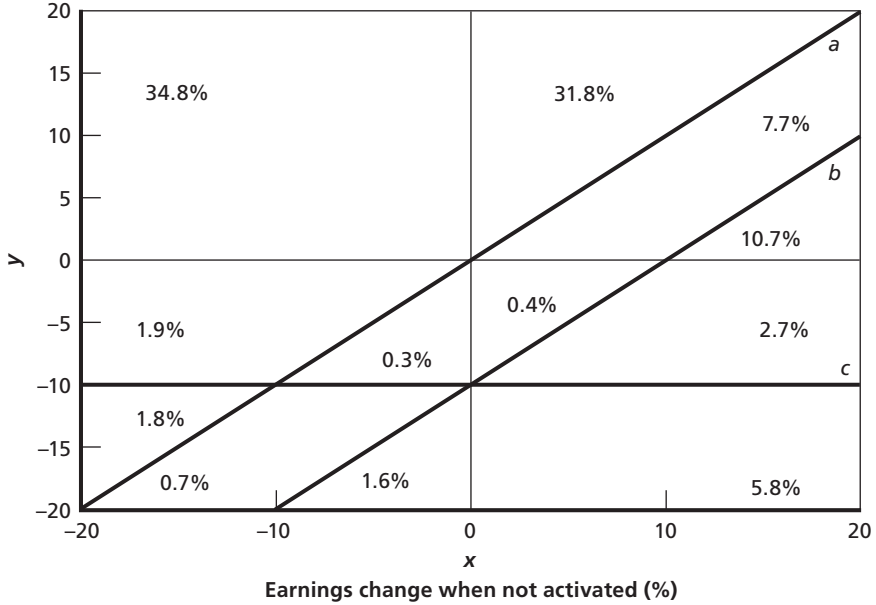
NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and more than 30 days in 2002 or 2003. The figure assumes the distributions of earnings changes are independent.

RAND *MG474-E.1*

in earnings) than they would have experienced had they not been activated; conversely, the figures imply that the remaining 35 percent of activated reservists experience larger losses in earnings (smaller gains in earnings) than they would have experienced had they not been activated (draws that lie below the 45-degree line drawn through the origins of the figures). Note, however, that these activated reservists do not know what their earnings would have been if not activated, so no one can be sure he was a "loser," and, on average, there are fewer "losers" relative to the base year.

We also draw 45-degree lines in Figures E.1 and E.2 that lie $10,000 or 10 percentage points below the origin. These dashed lines represent the break points for earnings losses when activated that exceed $10,000 or 10 percent of base-year earnings. Under the assump-

Figure E.2
Distribution of Percentage Earnings Change When Activated and Not Activated



NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and more than 30 days in 2002 or 2003. The figure assumes the distributions of earnings changes are independent.

RAND *MG474-E.2*

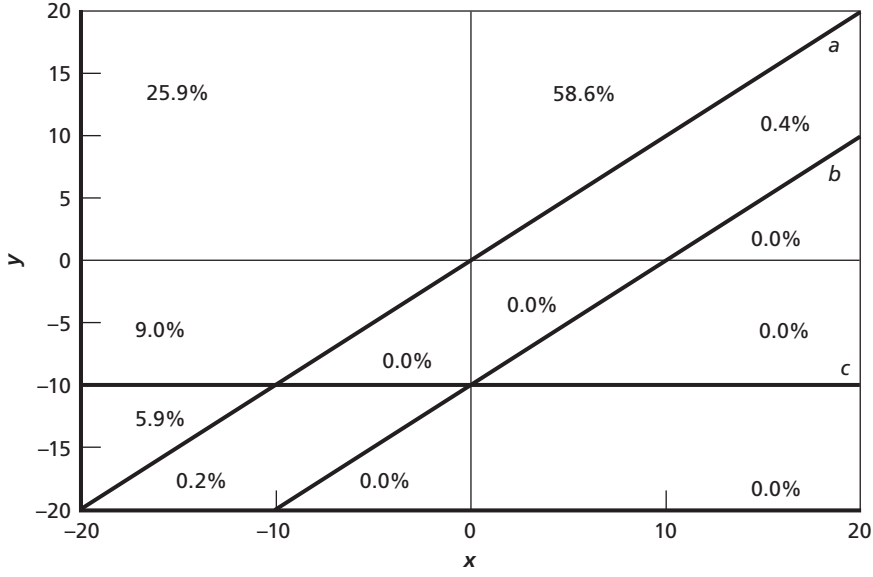
tion of independence, the figures indicate that 18 percent of activated reservists experienced losses in earnings (gains in earnings) that are at least $10,000 more (less) than they would have experienced had they not been activated (Figure E.1) and 26 percent of activated reservists experienced losses in earnings (gains in earnings) that are at least 10 percentage points greater (less) than they would have experienced had they not been activated (Figure E.2).

One way to compare these alternative net loss estimates to the gross loss estimates presented earlier in this chapter is as follows. Our simulation shows that about 21 percent of observations lie below the horizontal axes in Figures E.1 and E.2, meaning that 21 percent of reservists experienced an earnings loss when activated in 2002 or 2003. This percentage corresponds exactly to the percentage experiencing an earnings

loss in Figures 5.1 and 5.2. Figures E.1 and E.2 also show, however, that under the assumption of independence, 5 percent of reservists experiencing an earnings loss when activated would have experienced an earnings loss of an even greater magnitude had they not been activated. Consequently, we can say that 16 percent of activated reservists experienced an earnings loss and that loss was of a greater magnitude than they would have experienced had they not been activated.

Figures E.3 and E.4 present equivalent results under the alternative, polar (and, in our opinion, less plausible) assumption of perfect correlation between earnings changes when activated and when not activated. Heckman, Smith, and Clements (1997) note that this assumption is consistent with a simple version of the conventional econometric model for program evaluation. Under this assumption of

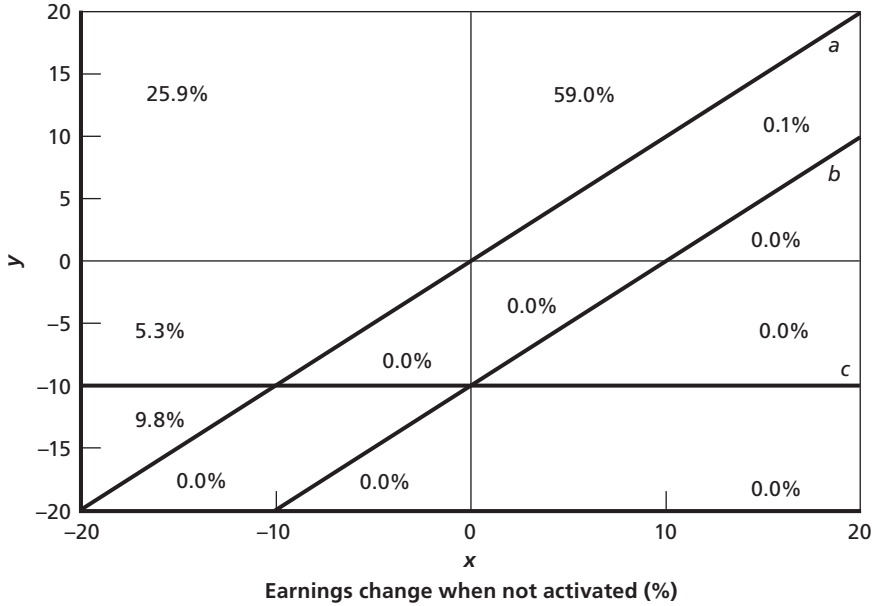
Figure E.3
Distribution of Absolute Earnings Change When Activated and Not Activated: Perfect Positive Correlation



NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and more than 30 days in 2002 or 2003. The figure assumes the distributions of earnings changes are perfectly positively correlated.

RAND *MG474-E.3*

Figure E.4
Distribution of Percentage Earnings Change When Activated and Not Activated: Perfect Positive Correlation

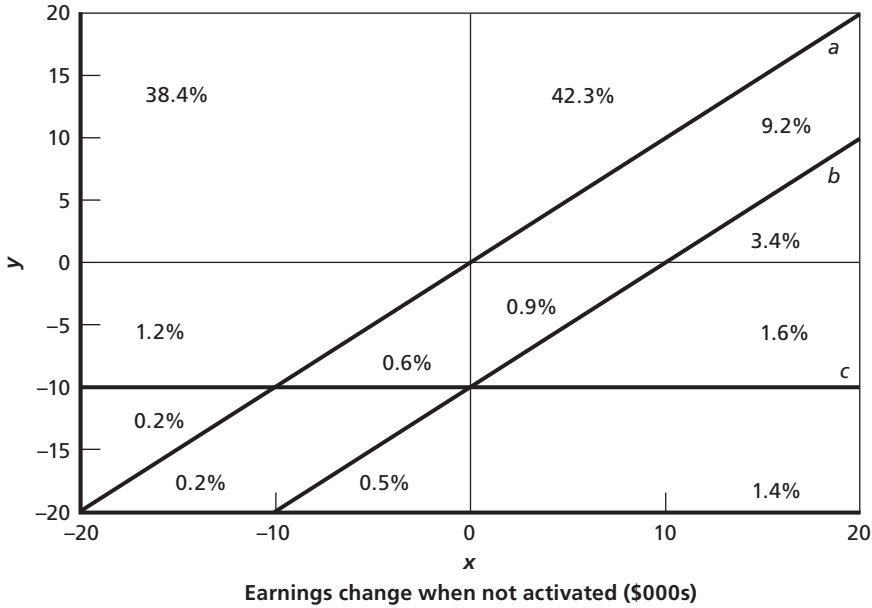


NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and more than 30 days in 2002 or 2003. The figure assumes the distributions of earnings changes are perfectly positively correlated.

RAND *MG474-E.4*

perfect correlation, many more activated reservists have losses relative to what their earnings would have been if not activated. This appears to be because the variance in the change in civilian earnings is so large (relative to the variance in the changes in military earnings) that it swamps the mean increase in earnings through much of the upper tail of the distribution (i.e., under the assumption of perfect positive correlation, those with large gains when activated would have had even larger gains if not activated). While we present these results (based on the assumption of perfect positive correlation), they do not seem plausible. We therefore do not discuss them further.

Figure E.5
Distribution of Absolute Earnings Change When Activated and Not Activated for Those Activated 271 or More Days in 2003

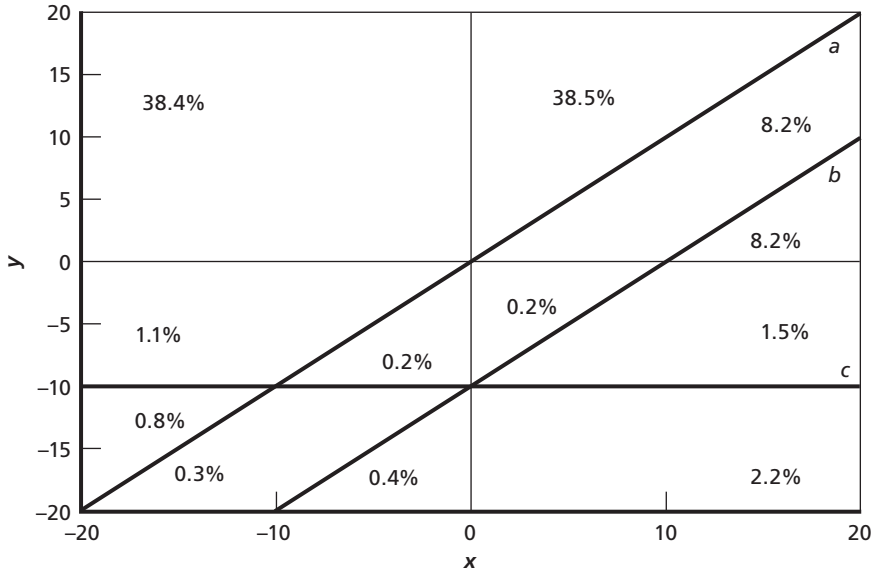


NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and 271 or more days in 2003. The figure assumes the distributions of earnings changes are independent.

RAND *MG474-E.5*

Figures E.5 and E.6 present the joint distribution of earnings changes for long activations (271 or more days) in 2003 under the independence assumption. In this group (gross and net) mean earnings increases are much larger. As expected, the probability of a loss when activated relative to when not activated is much smaller.

Figure E.6
Distribution of Percentage Earnings Change When Activated and Not Activated for Those Activated 271 or More Days in 2003



NOTE: Sample restricted to reservists serving 0–30 active-duty days in 2000 and more than 270 days in 2003. The figure assumes the distributions of earnings changes are independent.

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APPENDIX F

Detailed Description of the Alternative Method

This appendix provides some additional detail on the computation of the alternative method. More motivation can be found in our earlier document (Klerman, Loughran, and Martin, 2005).

Recall the motivation for this alternative method. Our primary method uses civilian and military earnings in each year to compute the effects of activation. However, for 2004 we have military pay files, but no Social Security earnings data. Our goal is to use the available information to create a proxy for earnings of activated reservists in 2004.

The Concept of Interest

For this alternative method, we define our concept of interest in such a way that it can be approximated from the available information. Specifically, we define our concept of interest as the change in earnings of a reservist between some base year in which the reservist was not activated (beyond inactive duty training; i.e., not even active duty training) and some out year in which the reservist was activated for the entire year.

If we would observe a random sample of reservists who did not serve on active duty in some base year, but did serve on active duty for all of some out year, we could estimate the annual change in earnings for each reservist:

$$\Delta_{base\_year,out\_year} = G[\, a_{out\_year} \,] - (\, c_{base\_year} + r_{base\_year} \,) \qquad \text{(F.1)}$$

The second term on the right-hand side of Equation (F.1) is base-year civilian earnings plus inactive-duty training reserve earnings. In the balance of this appendix, we refer to this sum as unactivated earnings.

The first term on the right-hand side of Equation (F.1) is more complicated. Unactivated earnings are (almost exclusively) "gross earnings" (i.e., earnings before taxes). Therefore, an appropriate comparison to military earnings would also be "gross earnings" (i.e., before-tax earnings). However, some components of military compensation—military pay received while serving in a combat zone and all allowances—are not subject to federal taxation (neither federal income taxes, nor Federal Insurance Contribution Act [FICA] and Medicare payroll taxes).[1] Therefore, an appropriate comparison would be to the level of gross taxable earnings yielding the same net earnings as the military compensation package accounting for the tax advantage. The *G* function represents the required computations to adjust activated earnings for the federal tax advantage conferred on certain components of those earnings (i.e., it computes the taxable earnings required to yield the after-tax value of military compensations).[2]

This tax adjustment is conceptually similar to the tax advantage component of Regular Military Compensation (RMC). In practice, we compute the tax advantage assuming a reservist is not married, has

[1] We only consider basic pay earned for IDT. It is almost always taxable (unless the reservist spent IDT in a combat zone). There is thus essentially no tax advantage in the base year. We therefore do not include a *G* function with the second term.

[2] The notation in Equations (F.1) and (F.2) is not strictly correct. Computing the value of the tax advantage requires not only knowledge of total military compensation, but also knowledge of the division of that total military compensation into its taxable and nontaxable components.

no dependents, and no income beyond military and civilian earnings.[3] Unlike the conventional RMC calculation for the active forces, our tax computations consider FICA and Medicare taxes.

We only consider the impact of federal taxes. Some states also give preferential tax treatment to military pays and allowances. We do not account for these tax advantages in this analysis. Accounting for these state tax advantages would increase our estimates of earnings while activated.

Approximating Changes in Earnings

Few people have no time on active duty in one year and all of the other year on active duty. Thus, we cannot directly compute the differences in Equation (E.1) from our data. Instead, we approximate the concept of interest by extrapolating from per day earnings.

Specifically, from the active-duty pay file, we have:

d—active-duty days; computed by dividing active-duty pay on the military pay files by the corresponding basic pay for the rank recorded for this month on the active-duty pay file

i—basic pay for IDT (i.e., drill pay)

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[3] We adopt this simplifying assumption because the data sources we use for the computations reported here do not include information on family structure (except as could be inferred from specific pays) or on civilian earnings of other family members. We note that this simplifying assumption has offsetting biases. The presence of a spouse and children would allow the reservist to use a different filing status with lower tax rates at each level of income and perhaps to claim the Earned Income Tax Credit (EITC). Offsetting this upward bias in taxes paid is the possibility that the activated reservist had in some year earnings not reported to SSA or that other members of the household (e.g., spouse or children) had earnings. Such earnings would imply higher taxes paid.

In follow-on work for this project, we will relax this assumption. We will impute family structure and the civilian earnings of spouses using other DoD survey data.

We note that the conventional Green Book figure for RMC for members of the Active Duty Force is also an approximation. It also assumes no other income. For members of the Active Duty Force, the assumption of no civilian earnings is plausible. The assumption of no nonlabor earnings is perhaps also plausible. The assumption of no spousal earnings seems less plausible. That assumption will bias (downward) the value of the tax advantage of some components of military compensation.

p—other military pays

a—total military allowances

Furthermore, from the SSA data, we know total pay—civilian and military:

s—SSA earnings: they include civilian pay, basic pay for IDT, and other military pays; they do not include military allowances.

We can therefore compute earnings per day when not on active duty and when on active duty (activated, thus the "a" subscript) as:

$$e_u = \frac{s - p}{360 - d}; \qquad e_a = \frac{p + a}{d} \tag{F.2}$$

respectively.

This approximation is far from perfect. Even when not activated, reservists should spend about 30 days per year on ADT (unactivated, thus the "u" subscript). There are some other pays and allowances associated with active-duty service. We explored several approaches to these issues (e.g., assigning the first 30 days of active duty as unactivated, allocating other pays and allowances). We implemented one of them in our earlier paper (Klerman, Loughran, and Martin, 2005). None of them are totally satisfactory. They give anomalous results, at least for some cases. (Doyle and Gotz, 2005, report similar issues.) Given that the analysis here is primarily an "earning warning" as to whether subsequent years are likely to be very different, this simple approach to computing per day earnings seems sufficient.

Valuing the Tax Advantage

Finally, we need to compute the value of the tax preference. While the tax preference appears in formula F.1, the previous discussion was in terms of pretax dollars. However, our concept of interest does include the tax advantage. Specifically, we want to compute the tax advantage, Δ:

$$N[\, e^t \,] + e^u = N[\, e^t + e^u + \Delta] \tag{F.3}$$

where N is net income (i.e., after taxes) and the t and u subscripts refer to taxable and untaxable components of income. Thus, Δ, is the increment in taxable income to make the earnings package (taxable and untaxable) equal to an equivalent package in which all components were taxable.

This is the concept. We need to apply it to our proxies for daily peacetime and wartime earnings. The challenge is that taxes are computed on an annual basis. Thus, to compute the value of the tax advantage, Δ, on a given day, we need to know the value of taxable earnings in the other months. Furthermore, we do not observe civilian earnings in the out years (in particular, 2004). Instead, we estimate civilian earnings from 2000 information and 2002/3/4 military earnings from the RPF. Our estimate of annual (gross) earnings is:

$$e = e_u \times (360 - d) + e_a \times d \tag{F.4}$$

We proceed as follows. Note that we can decompose civilian and military earnings (per day) into taxed and not taxed components (with t and n superscripts, respectively). So our approximation to total annual earnings can be written as:

$$e = e_u^t \times (360 - d) + (e_a^t + e_a^n) \times d \tag{F.5}$$

Then, the value of the tax preference, Δ, solves the equation:

$$\begin{aligned} N[e_u^t \times (360 - d) + e_a^t \times d] + \{e_a^n \times d\} \\ = N[e_u^t \times (360 - d) + (e_a^t + e_a^n) \times d + \Delta] \end{aligned} \tag{F.6}$$

That is, we compute the tax preference as a function of all earnings while on active duty plus taxable earnings while not on active duty (where the later term puts the reservist in the right tax bracket).[4]

Our estimate of total (i.e., including the tax preference) annual (with a "hat") earnings when mobilized is then:

$$\hat{m} = 360 \times (e_a^t + e_a^n + \Delta) \qquad \text{(F.7)}$$

[4] An alternative approach would also consider the untaxable portion of peacetime earnings (i.e., BAH and BAS while on ADT). The nature approach would be to include untaxable peacetime earnings in parallel with untaxable wartime earnings. That approach is incorrect. It will ascribe the tax advantage of peacetime earnings to wartime daily earnings. Consistent approaches would require multiple tax computations and more assumptions. Since BAH and BAS are small for ADT, any further adjustment is not likely to be worth the effort.

APPENDIX G

A Note on Selection with Changing Probability of Activation

The conclusion to the report argues that observed earnings losses are an upper bound on earnings losses to be expected in the future. The argument is one of "selection." When the probability of activation was perceived to be low, those with large losses on activation might still have enlisted/reenlisted. As the probability of activation rises (as it has), those with high losses would be expected to "select out," that is, to not enlist/reenlist. This appendix outlines an economic model in which this result can be formally demonstrated.

Individual's Choice Problem

The basic insight of the model is to conceptualize reserve duty as composed of two states of the world:

- *N/Not Activated:* When not activated, the reservist receives military pay m_N for reserve duty in addition to civilian pay y_C from his/her civilian job (where each of these pays should be thought of as per day in each state). Here, we conceptualize m_N to include all components of compensation—pay, allowances, and other benefits (e.g., health care, education). In addition, he bears a dollar-valued disutility of reserve service (possibly negative; i.e., all else equal, he prefers being in the reserves unactivated to being a civilian), τ_N.

- *A/Activated:* When activated, the reservist receives m_A for reserve duty, but forfeits his/her civilian job (there is no "civilian top-off"). This compensation while on active duty is assumed identical to that received by members of the active-duty force. In addition, he bears a dollar-valued disutility of active duty service (possibly negative; i.e., all else equal, he prefers being activated to being a civilian), τ_A.

With probability, ρ, the reservist is activated in any period; with probability 1-ρ the reservist is not activated in that period. Alternatively, the individual can join the active duty forces and receive m_A; that is, the assumption that when activated the reserve forces are compensated exactly as are the active duty forces. Finally, the model is closed with linear expected utility.

The model is clearly oversimplified. Linear utility is not realistic. Actual military compensation—for the actives and for the reserves—varies with component and the specific deployment (e.g., receipt of FSA/Family Separation Allowance, HFP/Hostile Fire Pay, CZTE/Combat Zone Tax Exclusion). Bonuses and other considerations imply that compensation received by reservists while on active duty is not identical to compensation received by active-duty forces. Finally, here we assume that civilian compensation is independent of the probability of activation and whether or not the individual joins the reserves. Each of these restrictions could be relaxed. This simple framework allows an apparently insightful graphical analysis. Furthermore, most of the basic results appear to carry over to a more complex model.

Given the assumption of linear utility, a potential recruit will join/stay in the active forces versus remaining a civilian if:

$$y_c < m_A - \tau_A \qquad \text{(G.1)}$$

(ignoring the possibility of joining the reserves). Note that the boundary implied by this expression can be rewritten as a vertical line in τ_N,($\tau_A + y$) space. Similarly, a potential recruit will join/stay in the reserves when:

$$y_c < \rho(m_A - \tau_A) + (1 - \rho)(y_c + m_N - \tau_N) \qquad \text{(G.2)}$$

(again, ignoring the possibility of joining the active forces). The boundary implied by this expression can also be rewritten as a line in $\tau_N, (\tau_A + y)$ space. In this space, the line has negative slope and a positive intercept with the y-axis:

$$\tau_N < + \left\{ \frac{\rho}{1-\rho} \; m_A + m_N \right\} \; \frac{\rho}{1-\rho} \; (\tau_A + y_c) \qquad \text{(G.3)}$$

Note that the slope of this line is only a function of the probability of activation, ρ. Increases/decreases in compensation with activation, nonactivation, or both (e.g., bonuses) simply shift the line to the left/right.

Finally, an individual who would enlist in either the active-duty forces or the reserve forces will join the reserves if:

$$m_A - \tau_A < \rho(m_A - \tau_A) + (1-\rho)(y_c + m_N - \tau_N) \qquad \text{(G.4)}$$

or equivalently if:

$$\tau_N < -(m_A - m_N) + (\tau_A + y_c) \qquad \text{(G.5)}$$

that is, again, the boundary implied by this expression is a line in $\tau_N, (\tau_A + y_c)$ space—this time with a positive slope and a negative intercept with the y-axis. Note that the slope of this line is always one, independent of compensation or the probability of activation. Increases/decreases in compensation with activation, nonactivation, or both (e.g., bonuses) simply shift the line to the left/right.

Heterogeneity

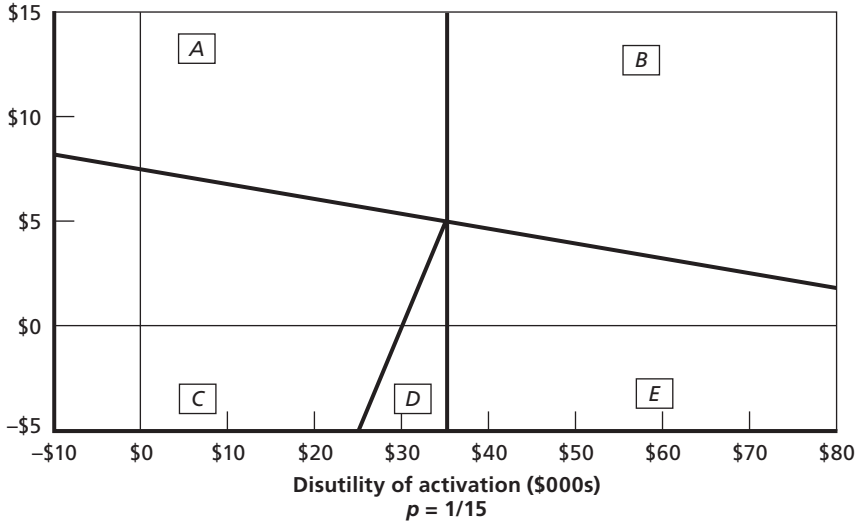
This is the choice for a given individual. We expect tastes for the reserve duty, τ_N, active duty, τ_A, and civilian labor market opportunities, y_c, to vary across individuals. For example, subscripting by individuals, *i,* Equation (F.3) becomes:

$$\tau_{N,i} < + \left\{ \frac{\rho}{1-\rho} \; m_A + m_N \right\} \frac{\rho}{1-\rho} \, (\tau_{A,i} + y_{c,i}) \qquad \text{(G.6)}$$

Figure G.1 portrays this choice problem graphically. Each point on Figure G.1 represents a combination of preferences for active and reserve service. Specifically, along the horizontal axis Figure G.1 plots heterogeneity—specifically disutility—with respect to active-duty service ($\tau_{A,i} + \gamma_{c,i}$); along the vertical axis it plots heterogeneity with respect to reserve duty. By design, this is the space called out in the discussion following equations (G.1), (G.3), and (G.5). For this space, moving in the southwest, potential reservists have both lower disutility of active-duty service and lower disutility of nonactivation while in the reserves.

Figure G.1 considers the case when active-duty compensation and reserve compensation are exactly linked, that is, no component-specific pay or bonuses (and noncash benefits are exactly proportional to time on active duty). Specifically, Figure G.1 plots the case in which DoD offers $5,000 per year for nonactivated reserve duty and $35,000

Figure G.1
The Reserve Enlistment/Reenlistment Decision



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per year for activated reserve compensation. These numbers are very roughly correct for mid-level enlisted forces deployed to Iraq today. On Figure F.2, this is the point where the three lines meet.

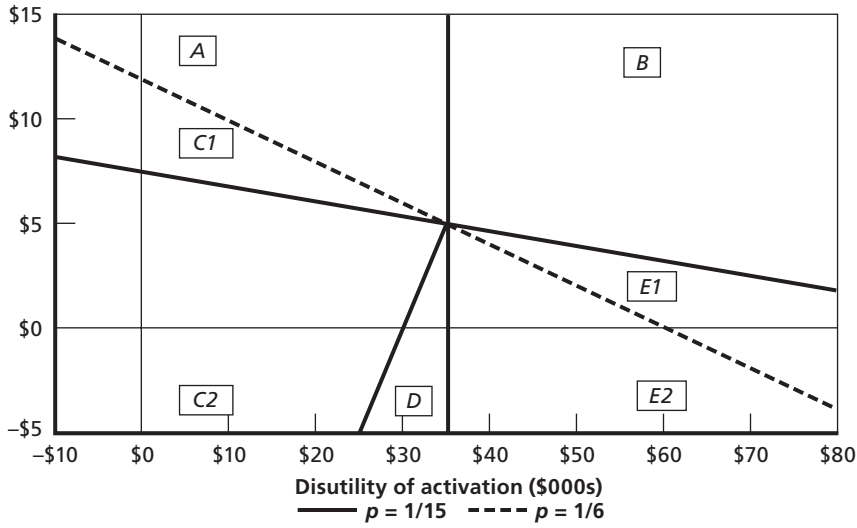
For this model, and given this specification, people with preferences in regions D and E choose to join the reserves; people with preferences in regions A and C choose to join the active forces, and people in region B remain civilians. This should be consistent with intuition. People with very high distaste for both active-duty service and reserve service (i.e., to the northeast) join neither the actives nor the reserves; that is, region B. People with (relatively) high distaste for active-duty service, but low distaste for reserve service (i.e., to the southeast) join the reserves; that is, region E (and it turns out region D). People with (relatively) high distaste for reserve service, but low distaste for active-duty service (i.e., to the northwest) join the active forces, that is, region A and region C.

The size of each group will depend on the population distribution of disutilities/distastes (including civilian wage offers). Such a distribution of preferences would be represented as a contour chart on Figure G.1. Figure G.1 is busy enough. We do not draw those contour lines.

Reserve Compensation as the Probability of Activation Increases

Now consider what happens when the probability of activation rises—as it has recently. This situation is displayed in Figure G.2. In that case, the line along which people are indifferent between enlisting and not enlisting in the reserves rotates clockwise around the point at which DoD pays exactly the individual's disutility in each state of the world (including foregone civilian earnings, if activated)—for the solid negatively sloped line to the even steeper (in absolute value) dashed negatively sloped line. Thus, people in region E1 no longer enlist in the reserves. This is the result claimed in the body of this paper. If the only choice was between the reserves and civilian life, people in region C1 would now enlist in the reserves (rather than not enlist at all), however these people enlist in the actives no matter what the probability of activation.

Figure G.2
Effect of a Change in Probability of Activation on the Reserve Enlistment/ Reenlistment Decision



RAND *MG474-G.2*

Thus, this simple model implies that if DoD exactly links compensation for reserve forces on active duty to active-duty compensation, an increase in the probability of activation lowers the supply of reservists. DoD will need to raise some form of compensation to recruit and retain the current force.

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